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GENERAL ELECTRIC

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and "The Story of Horatio A. Smart"

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Then, all of a sudden, it came to him. "Of course," he cried, "I must have been sound asleep, I should be selling Private Interior Telephone Systems." (Going into action.) "Where's that Automatic Electric Company catalog?"

Well, the result was that Horatio promptly arranged to sell telephone systems and, he'll tell you himself, he's now got his cash register jingling like a runaway sleigh horse.

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Automatic Electric has been making both public and private telephone systems for over 40 years—making equipment to satisfy every requirement. Shown here are four of the many types of private systems available. Our field representative will be glad to supply you with literature, prices and discounts as well as to work with you on particular jobs. Call on him.

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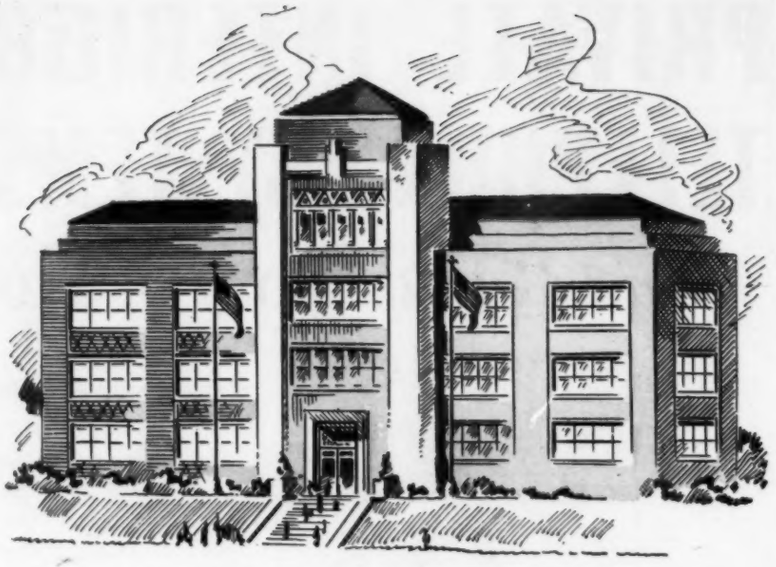
FOR THE SMALLEST TO THE LARGEST STAGE AND AUDITORIUM



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For Both Small and Large Installations: (FA) PRE-SELECTIVE REMOTE CONTROL SYSTEM . . . This is a composite pilot stage switchboard and dimmer bank with the capacity remote switches in the basement or other location. These are made for the Modified Pre-Selective Control, as well as the Pre-Selective All Master Control Systems.

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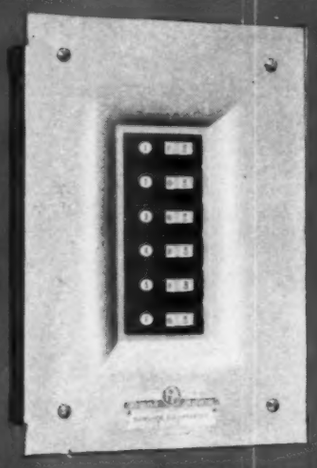

6 circuit and loss FA Service Equipment controlled by FA A. C. Circuit Breakers.

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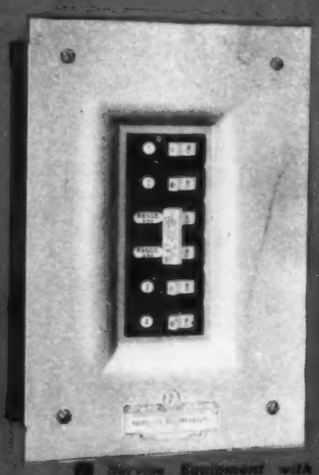
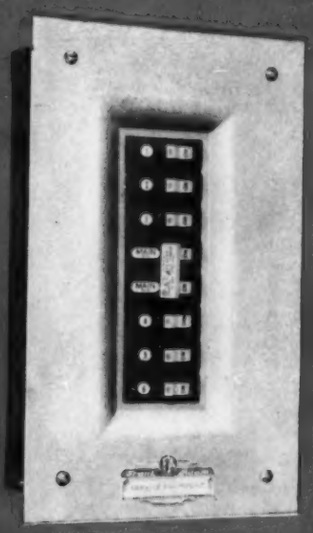
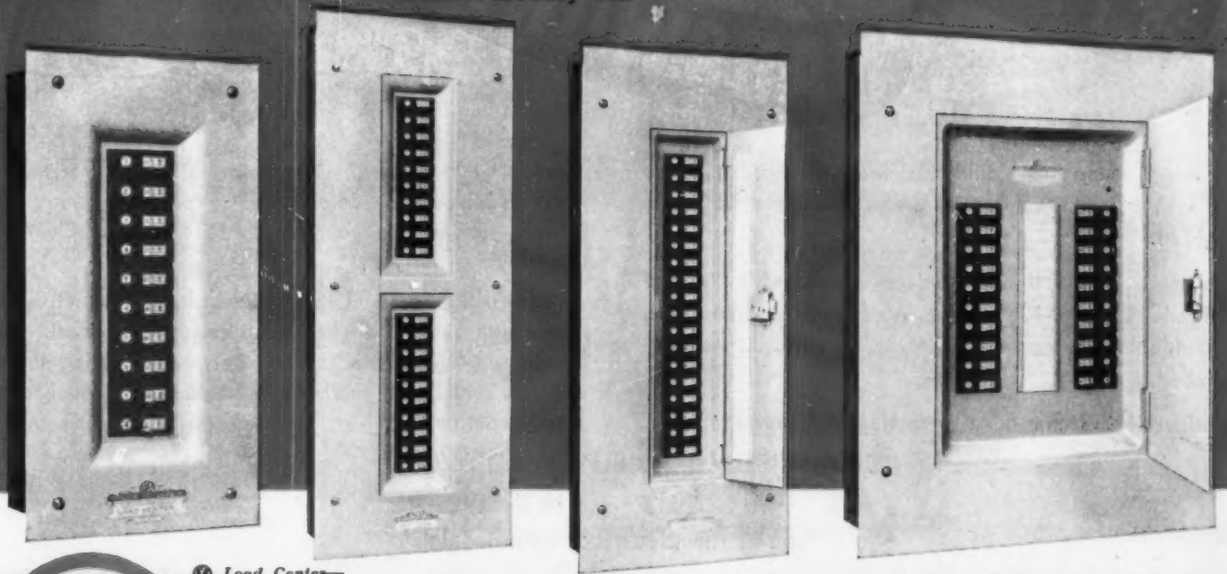
These FA A. C. Circuit Breaker Service Equipments, Load Centers and Panelboards give the Contractor the special advantages of a Complete Line that meets every standard requirement on small or large jobs. They are built to fit — you get deliveries from your Wholesaler when required — you link your reputation with the fifty-year-old prestige of FA — you satisfy Architects and Owners . . . Available February 1st.



FA Service Equipment with FA Double Pole 35 Amp. A. C. Circuit Breakers for range circuit. Also 4 single pole branch circuits.



FA Service Equipment with Double Pole 50 Amp. A. C. Circuit Breaker Main and 6 single pole A. C. Circuit Breakers of capacities required.



FA Load Center—with 10 Single Branch Circuits controlled by FA A. C. Circuit Breakers.

FA Load Center—20 circuits controlled by FA A. C. Circuit Breakers.

FA Panelboard—Single row A. C. Circuit Breaker with A. C. Circuit Breakers for all branch circuits.

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STICK TO WADSWORTH SWITCHES"

IF every young man could start life with the experience old men possess many costly errors could and would be avoided.

Seasoned Electrical Contractors agree with "Father Time's" advice. They know Wadsworth Switches are dependable . . . easy to work with . . . and . . . quickly installed.

Wadsworth Switches *have something* all Contractors like. That is why successful Contractors stick to Wadsworth. That is why "year after year" Wadsworth finds new friends among the young men entering the Electrical Contracting business.

Wadsworth is resolved to give Electrical Contractors the same high quality switches in future, as in the past. We pledge ourselves *anew* to carry on the everlasting search for new and better methods in keeping with sound electrical practice.

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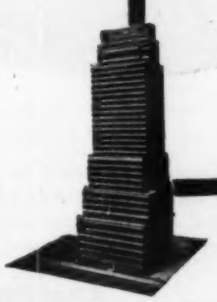

A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.

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NEWS FOR THE CONTRACTOR FROM ANACONDA ENGINEERS

"Proving Grounds" have a place in electric cable manufacture, too

THE automobile manufacturer finds out how his car will stand up in service by submitting it to every sort of practical test in his proving ground. Similarly, we, too, have our "proving grounds," where cables are tested for indoor, underground or outdoor service.

The principal one is at the Hastings-on-Hudson mill. Here Anaconda products undergo intensive abuse of many kinds. From what we learn during these tests, we are able to build superior quality into Anaconda cables. Such quality as to make them stand up longer in service.

In the larger photograph, cables are undergoing high voltage tests of long duration. In the smaller photograph is shown an experimental test pole where various types of service condition tests are conducted at many times normal voltage. Such proving-ground tests impose conditions far more severe than those of actual service, and reveal what usage an insulation will stand and how it can be improved.

Put your problem up to Anaconda engineers

When you have an installation problem, put it up to Anaconda engineers; it may be that Anaconda research can help speed the answer. Your day-to-day requirements will also receive prompt and careful attention. 38429

Above. *Lengths of Anaconda cables undergoing high voltage tests at the Hastings-on-Hudson "proving ground."*

At left. *View of experimental test pole in yard at the Hastings-on-Hudson mill. Here various types of service condition tests are conducted at many times normal voltage. (Experimental vertical riser tower in background.)*

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electrical contracting

JANUARY, 1939

Funny Cuss—Who?

A COUSIN OF MINE paid his way through college selling books on how to succeed at merchandising or maybe farming. He could work himself into a lather on any subject.

ONE RAINY DAY HE CAUGHT A FARMER in his barn and talked his ear flat up against his head. But the farmer took a straw out of his mouth and said—"Why shucks! young man. I don't want a lot of new ideas. I ain't farmin' this place, right now, as good as I know how."

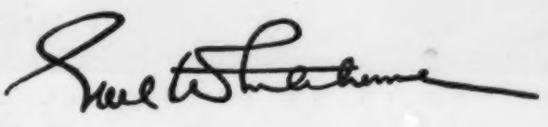
"HA! HA!"—WE LAUGH. "The farmer is a funny cuss!" And yet to me this story points a finger straight at the electrical contractor. For he too does not seem to want to know. He also, in some ways, appears to turn his back on knowledge and experience.

WITH A NEW YEAR ON THE DOORSTEP, for example, everybody naturally thinks ahead, wants to make plans. But what can we do, we contractors? Members of an industry cannot plan as individuals only. And yet we have so little data on our field, so little to plan with, such meagre evidence of where we stand and why, in our relation to important trends.

SOME DAY WE WILL BESTIR OURSELVES and see the benefits. We'll have a quarterly breakdown of the electrical construction business. We'll have a periodic picture of the moving market to guide each man who is a part of it. And out of that will naturally come clear cut objectives that an awakened organized industry will aggressively pursue.

MEANWHILE, AS A FRAGMENTARY SAMPLE, a mere gesture to help illustrate the point, please note upon another page an editorial study of four cities. And on another page, a suggested program for the electrical contractor. But why only a suggestion?

THIS CONTRACTING INDUSTRY SHOULD ORGANIZE ITSELF both locally and nationally and *create* a better progress and prosperity for itself. It should no longer be content to drift with the building trades or ride on electrical expansion. It should enjoy rich fruits of its own gathering. It can be done. Well—why not do it now?



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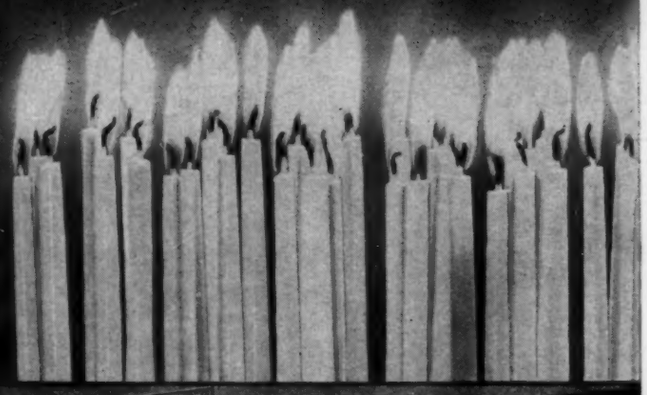
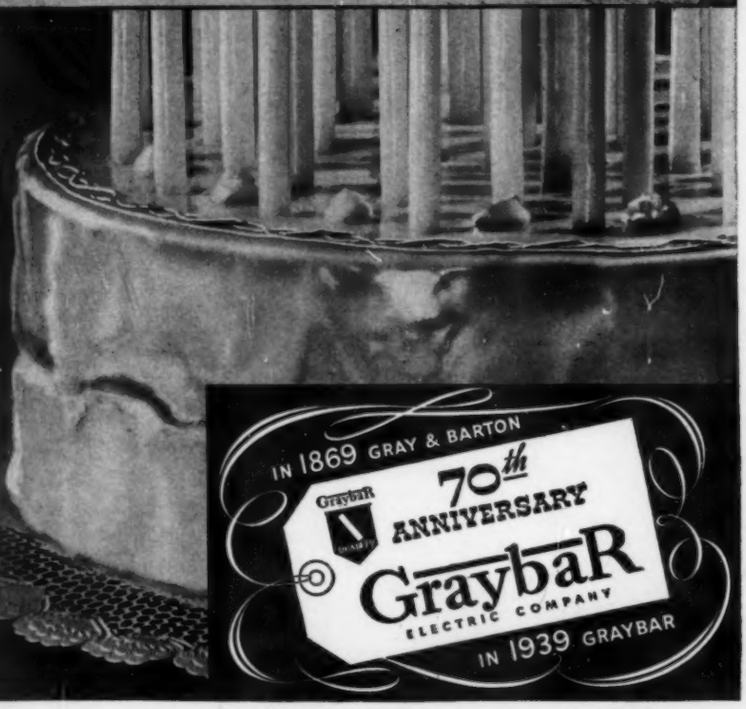


IN 1869
GRAY & BARTON



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OFFICES IN 83 PRINCIPAL CITIES FROM COAST TO COAST

4 Cities Tell a Tale

An editorial survey of the parts played by contractors and motor shops in industrial plant electrical operation reveals some interesting conditions, advances some conclusions.

WE MAKE A SURVEY—*Editorial representative of Electrical Contracting getting the facts from plant men responsible for electrical maintenance.*

TO study the present position of the electrical contractor and the motor shop in the industrial market, ELECTRICAL CONTRACTING has just made an editorial survey of four cities. Six more cities will be surveyed shortly in search of further data.

We wanted to see how much work the electrical contractor is doing today in factories—large factories that have their own maintenance staffs and small factories that have no electricians of their own. We wanted to see how motor repair work relates itself to other maintenance problems. We wanted to see how far the idea of making periodic system surveys and tests is taking hold in factories.

So we sent a man to "City A" in New England, where there are around 180,000 population and many factories. We sent a man to "City B" in the middle Atlantic area, with about 60,000 people. Other men went to "City C", with some 300,000 inhabitants in the Great Lakes area, and to "City D" in the Mississippi Valley, rated in size slightly over 100,000. Each man took with him a list of local industries which he checked over with the local power company. He classified these plants as to total horsepower connected not including the lighting. Then he visted the principal electrical contractors, the motor repair shops and the wholesalers and got the picture from them.

With this four sided background he called on the factories—every factory above 100 h.p., except in "City C" which was so large that we made a coverage of plants over 250 h.p. A variety of smaller plants were also visited in each city to obtain a fair sampling of local conditions.

In the four cities, 183 factories were visited and the editor discussed with plant executives or heads of the maintenance departments the basis on which their electrical wiring, motor repair and maintenance work is handled. This confidential information was entered on written reports.

The returns on "City D" are not quite as complete as for the other three. "City D" was the first town surveyed—the "guinea pig" town. Experience here gave us direction for the succeeding studies, just as the results from this group will somewhat broaden our analysis in the six cities that are to follow. But "City D" was also interesting because the relation of the contractors to the factories there is not as close as in "A" "B" and "C" and the effect of this is striking.

GENERAL CONDITIONS IN THE FOUR CITIES

	CITY A	CITY B	CITY C	CITY D
POPULATION	180,000	60,000	300,000	110,000
Number of plants surveyed	61	47	49	26
Total connected horsepower	64,688	35,627	81,677	110,769
Range in size and number of plants covered				
a. Plants above 2500 hp.	7—All	5—All	7—All	8—All
b. Plants from 1001 to 2500	4—All	4—All	17—All	None—Ex.
c. Plants from 250 to 1000	39—All	19—All	21—Part	8—Part
d. Plants below 250 hp.	11—Part	19—Part	2—Part	10—Part
Total expenditures per year reported for electrical products (for number plants stated)	(61 plants) $172,750.00	(46 plants) $75,600.00	(47 plants) $185,100.00	(25 plants) $113,750.00
Average expenditure per plant per year	$2,864.00	$2,080.00	$3,943.00	$4,505.00
Average expenditure per horsepower per year	$2.66	$2.68	$2.27	$1.03
Number of licensed contractors	95	24	50	23
Number of local motor shops	4	2	11	3
Number of electrical wholesalers	9	3	7	5
Of all plants visited, percentage that use contractors	80%	69%	86%	69%
a. Employed for new construction only	52%	50%	50%	39%
b. Employed for construction and changeovers	31%	22%	19%	22%
c. Employed for new construction, changeovers and other work	17%	28%	31%	39%
Total business given to contractors this year (for number of plants stated, all having of maintenance staff as well)	(25 plants) $164,665.00	(19 plants) $35,060.00	(9 plants) $18,530.00	(7 plants) $21,650.00
Average per plant for companies reporting	$6,546.00	$1,847.00	$2,060.00	$3,093.00

On the whole, however, these four communities may be taken as typical. They have their contrasts, of course, in size of dominant industries, in local labor conditions, in the number, size and enterprise of contractors and motor shops, in the number of wholesalers and the influence of power company policies and activities. But boil it all down and here are four industrial cities of different areas. The question is how are the contractors, motor shops and plant electrical departments relating themselves to each other?

We found a great many interesting things—some of which we expected and some we did not. We brought away sundry interesting reflections that cannot be dwelt upon now in this limited space. But in the main, we have developed out of these contacts, and we lift out of these four tabulations, the following ten observations; and we suggest a few major conclusions.

General Observations

1. *Size of Plant Staffs*—The number of men employed in the plant electrical staff of a factory varies in accordance with plant horsepower. In these four cities the average horsepower per electrical maintenance man ran 424 h.p., 420 h.p., 416 h.p. and 322 h.p. Larger plants do not materially alter the ratio of maintenance men to horsepower, for the four largest plants in each city visited totaled 167,499 h.p. for sixteen plants, in care of 362 plant men, or an average of 451 h.p. per man.

But plants with *only one* maintenance man employed averaged from 660 h.p., as in 20 plants in City A, to 343 h.p. in the 11 plants in City B. Four one-man staffs in City D averaged 400 h.p. and six in City C averaged 616 h.p.

2. *Plant Expenditure*—There is an average relationship between plant horsepower and annual expenditures for electrical products. In the four cities, these values ran $2.68, $2.66, $2.27 and $1.03 per h.p. The low is "City D".

3 *Wholesaler Influence*—The number of electrical wholesalers operating in a town and selling to industrial plants, does not necessarily hamper the local contractors from doing industrial work. City A has 9 wholesalers, yet 73 per cent of the large plants employ the contractor, compared with City B with 3 wholesalers where 62 per cent use contractors, and City C with 7 wholesalers where 57 per cent use contractors, and City D with 5 wholesalers where 58 per cent employ local contractors.

4. *Number of Contractors*—The number of contractors operating in a city also does not seem to affect the opportunity of those who specialize in service to factories. For in City A, where there are 95 licensed contractors, 7 are industrial specialists. These contractors averaged $48.143 each of industrial business. Meanwhile, in City B with 20 licensed contractors, 6 industrial specialists averaged $24,528 in factory work; in City C with 50 licensed contractors, 8 industrial specialists averaged $55,900 each; and in City D with 23 licensed contractors, 4 industrial specialists averaged $17,980 in factory work. Of course, in addition to these industrial specialists, many of the other licensed contractors in all four cities do industrial work in varying degrees.

5. *Size of Contractor*—The size of the contractor does not determine his ability to get industrial work. In City A three contractors with total volumes of $225,000, $206,000 and $100,000 respectively did 50, 45 and 50 per cent of their work in factories, while another with $75,000 volume had 70 per cent industrial, another with $35,000 volume had 10 per cent industrial and another with $20,000 volume reported 59 per cent industrial work. The other cities showed the same divergence.

6. *Contractor Purchases*—Industrial contractors are important buying factors in materials used by plants that do not operate their own staffs. In City A contractors select the brand on 76 per cent of the materials purchased and supply 82 per cent of it. In City B these ratios were 60 and 70; in City C, 50 and 67; and in City D 54 and 69 per cent respectively.

7. *Basis of Work*—More than a third of the industrial work done by the leading industrial contractors in City A and City C is sold on a cost plus or time-and-material basis. In City B, 48 per cent is on this basis but it involves a smaller dollar volume. The least favorable condition prevails in City D where the average industrial volume per contractor is low and 63 per cent of this work is secured by competitive bidding.

8. *Motor Repairs*—In the larger cities "A" and "C", industrial work bulks two-thirds the volume of the motor shops, (65% and 63%) because commercial, residential and rural motor repair work has been developed to interesting

proportions. But in City B the work is still 95 per cent industrial.

9. *Plant Surveys*—Among 118 larger plants with electrical staffs in the four cities, 65 factories or 55 per cent, make tests on their electrical systems. These tests are made at varying intervals—some to check changes in the load, others to reckon the performance of motors and quite a few to determine the condition of the insulation of feeders or motor windings, or machine defects.

10. *Plant Contact*—Plant men were asked what experts brought them the most help on problems of power use and equipment application. This means experts called in by the contractor on industrial jobs for his customers and by the plant staff head, where he is doing the work himself. This is an abstract question but the answers indicate a conscious recognition. Reduced to figures, by valuing a first choice at 10, a second choice at 5 and a third choice at 3, the record is—City A, manufacturer 267, power company 234, wholesaler 154; City B, wholesaler 257, manufacturer 244, power company 123; City C, manufacturer 259, wholesaler 198, power company 135; and City D, wholesaler 160, manufacturer 85, power company 68.

Some General Conclusions

Out of these general observations and a study of these tabulations and the many reports come a few general conclusions that are worth consideration. Further, more particular conclusions will follow as further cities are surveyed and other aspects of the situation are discussed. Above it all, however, these points stand out—

11. *Two Kinds of Industrial Customers*—In so far as concerns the industrial market opportunity for electrical contractors and motor shops, there is a clear cut dividing line between those factories that employ their own electrical maintenance staffs, and those that do not. Factories that hire no electrical men themselves, naturally rely entirely upon outside help for their electrical work. But this does not mean that the larger factories are not salable prospects and profitable customers for the local electrical firms. To the contrary, the larger the factory and the larger the plant staff, the more business there is for the contractor and the motor shop.

12. *Plant Staff Organization*—Those industrials that operate their own electrical maintenance staffs we found employ one man per 370 horsepower of connected load to take a general average. To be efficient that staff must have an even load of work day in day out, in caring for the usual maintenance work. No extra men are kept on hand waiting for emergency repairs when major breakdowns come, or to handle large wiring jobs involved by major changeovers or plant expansions. This opens the door wide to the industrial contractor and to the motor shop.

13. *Plant Staff Responsibility*—Industrial executives do not look to their plant staffs for these extra services involving design and engineering and broad experience. The job of the plant staff is to keep the plant running. To do so they must specialize on the electrical applications and problems involved in the production processes and the equipment of that plant. Management prefers to place responsibility for the unusual work occasioned by major breakdowns and plant expansions upon outside experts and specialists whose broader current experience keeps them more up to date and gives them a wider skill. Again, this brings immediate opportunity to the contractor and motor shop.

14. *Organized Plant Testing*—Only half the plants visited—those that maintain their own electrical staffs—are now making regular periodic system tests and surveys. Far less attention is being given to this subject by the smaller factories that have no electrical staffs. This idea has not yet been sold.

15. *Motors and Wiring Separate*—Many contractors feel that to secure a profitable industrial business, they must operate motor repair shops in conjunction with the wiring business. These four cities demonstrate that this certainly is not the fact. In City A only one of the leading industrial contractors handles motor repairs in his own shop. These two services to factories may be successfully conducted separately.

16. *Competition*—The basis on which industrial business is secured by the contractors in these four cities will stand a little study. In City B, 48 per

WHAT CONTRACTORS DO FOR INDUSTRIALS

POPULATION	CITY A 180,000	CITY B 60,000	CITY C 300,000	CITY D 110,000
Number of leading industrial contractors visited	7	6	7	6
They do a total annual volume in all departments of	$711,000.00	$230,000.00	$675,000.00	$208,000.00
Total annual volume of industrial business	$337,000.00	$147,167.00	$391,000.00	$107,880.00
Percentage industrial work to total volume	47%	64%	58%	52%
Average annual volume industrial business per contractor	$48,143.00	$24,528.00	$55,900.00	$17,980.00
Average number of active industrial accounts	37	31	25	No Data
Percentage of plants with maintenance forces, who also employ electrical contractors	73%	62%	57%	58%
Plants award their work to contractors —				
a. On a cost plus or T & M basis	38%	48%	32%	18%
b. By competitive bidding	35%	35%	57%	63%
c. Both cost plus and bids	27%	17%	11%	19%
Contractors determine brands of material used in large plants—				
a. Solely	23%	19%	8%	18%
b. Jointly with plant management	77%	81%	92%	82%
Contractors determine brands of material used in plants without maintenance staffs —				
a. Solely	76%	60%	50%	54%
b. Jointly with plant management	24%	40%	50%	46%
c. Contractor supplies materials	82%	70%	67%	69%
Average number years in business	21	20.5	21.1	No Data
Average number of plants called on regularly	53	No Data	39	
Number who also operate motor shops	1	3	2	2

HOW MOTOR SHOPS SERVE INDUSTRIALS

POPULATION	CITY A 180,000	CITY B 60,000	CITY C 300,000	CITY D 110,000
Number of qualified shops reporting	3	2	7	No Data
Total volume of business	$292,000.00	$73,600.00	$498,125.00	" "
Industrial volume—all shops	$190,000.00	$70,000.00	$337,500.00	" "
Average industrial volume — per shop	61,667.00	35,000.00	48,214.00	" "
Percent of volume—industrial	65%	95%	63%	" "
Percent of volume—commercial	19%	5%	24%	" "
Percent of volume—residential	12%	None	6%	" "
Percent of volume—rural	4%	None	7%	" "
Average number of industrial customers	127	55	68	" "
Average number called on	88	50	113	" "
Average investment in shop equipment	5,167	12,500	16,210	" "
Average investment in portable instruments	433	950	993	" "
Percentage of plants visited that employ motor service shops	95½%	83%	86%	88%
Number of shops that also operate a contracting department	None	2	1	2

HOW LARGE INDUSTRIALS OPERATE ELECTRICAL MAINTENANCE

POPULATION	CITY A 180,000	CITY B 60,000	CITY C 300,000	CITY D 110,000
Number of plants visited having maintenance staffs—"A" plants	44	37	37	19
Number of plants visited without maintenance staffs—"B" plants	17	10	12	7
Average h.p. of "B" plants	406	230	419	117
Average h.p. per electrical man employed in "A" plants	420	322	416	424
Percentage of "A" plants who claim to do all their construction work	27%	38%	43%	42%
Electrical supplies are purchased by "A" plants from—				
One wholesaler	9	13	4	4
Two or more wholesalers	31	24	32	13
Large apparatus purchases are made by "A" plants from (one or more sources)—				
Wholesalers	23	20	23	11
Manufacturers	31	25	27	6
Motor dealers and contractors	11	1	1	None
Most helpful to plant staffs among the representatives of—				
Electrical wholesalers	154	257	198	160
Electrical manufacturers	267	244	259	85
Power companies	234	123	135	68
(Ratings: First 10 points, second 5 points, and third 3 points)				
Percentage plants doing some minor motor repairs	52%	25%	39%	23%
Percentage plants doing all their motor repairs	4½%	17%	14%	11%
Percentage plants sending rewinds to motor shops	95½%	83%	86%	88%
Number plants that patronize out-of-town shops	6	4	No Data	1
Percentage of plants that make periodic system analyses or motor tests	48%	52%	52%	No Data
Number of plants that generate own power	3	6	5	" "

cent is taken cost-plus or time-and-material but in City D, 63 per cent is on competitive bidding. The natural deduction is that the local contractors in City D have not established themselves in the confidence of the local industries to the same degree. And this was found to be the case. In other words, not only the volume of the industrial business available in a city but the ease of securing it and the assurance of profit on it, is all dependent on the relationship which is established by the contractors and motor shops with local industries.

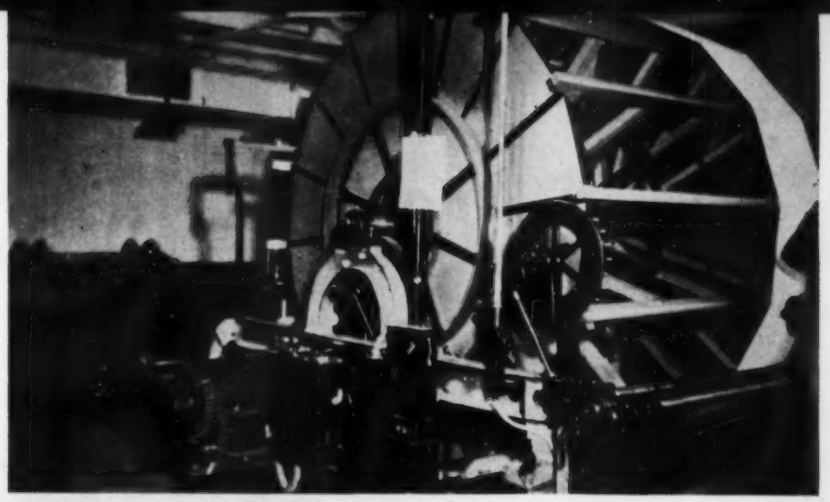
17. *How to Sell Industry*—And what should that relationship be? It would appear that the successful selling of the industrial market in any city depends upon the intelligent coordination of the natural functions of the plant maintenance staff on the one hand and the contractor and motor shop on the other. Where there is no plant staff, of course, it is a simple matter of selling needed services and by the use of instruments to survey system conditions and developing opportunities to improve efficiency. But where the plant staff is desired for orderly efficient continuous maintenance, then the contractor and motor shop must help that staff in a practical way.

Effective Cooperation

And, of course, that practical way is to frankly sell management on improving the efficiency of the plant force by having the factory electrical men specialize on the regular protection and production work of system maintenance and the operation of the electrical equipment—the vital job to the factory. Then let the industrial contractor and the motor shop stand by to handle special work involved in construction, for changeover and expansion, and the heavy and emergency repairs that are not organized into the daily schedule.

The result is a working cooperation between the chief electrician of the plant—or whatever his title may be—and the stand-by service of the contractor and the motor shop that is of mutual benefit. The plant staff is freed of the emergency burdens that otherwise periodically upset the maintenance work and lower its efficiency. The contractor and motor shop render a regular prescribed service to a customer for whose work they become responsible.

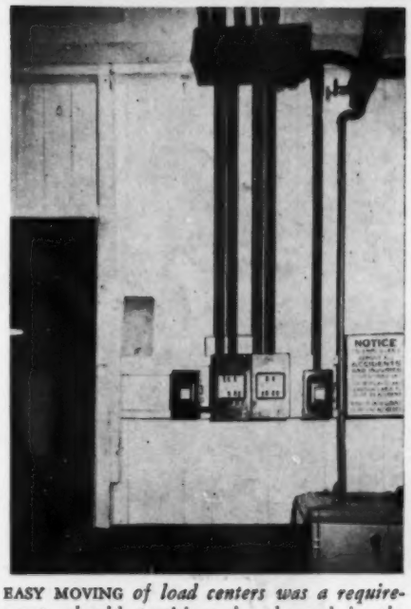
And the proof that this is practical, lies in the fact, that this is just the way it is being done. This is the way in which it is arranged between the most successful contractors and shops, and the factories that are doing the best job.



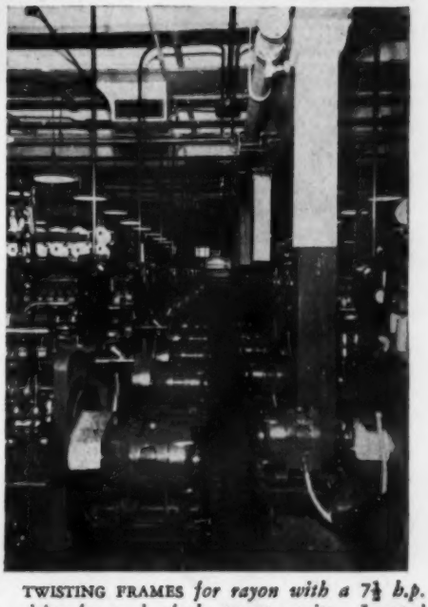
WARPING UNITS *employ exacting speed variations and a number of intricate relay-operated auxiliary control and signaling stations. The 3-h.p. multi-speed driving motor may be operated at 12 different speeds.*

Re-wiring FOR TEXTILES

An Old Factory Building is Rewired to New Standards for This Modern Rayon Mill



EASY MOVING *of load centers was a requirement, should partitions be changed in the future. Overhead junction boxes collect radial conduit runs to avoid expensive pipe changes later at panels.*



TWISTING FRAMES *for rayon with a 7½ h.p. drive for each of the twenty units. Located on the ground floor, the 440-volt circuits drop down to magnetic controls from ceilings, clearing air conditioning ducts.*

WHEN Aberfoyle, Inc., acquired a 40-year old building in Norfolk, Va., for use in producing fine rayon fabrics, it meant a $30,000 rewiring job to provide adequate power and lighting facilities. The existing system of open wiring and armored cable was found inadequate for supplying the desired standards of illumination and to operate some 600 hp. in motors.

Plans for the complete electrical modernization of this mill were prepared by the company's engineers in consultation with local power company engineers. The installation work was awarded on this basis to the Batte Electric Company of Norfolk.

Service and transformer capacity was provided to take care of the total machinery area, even though some departments have not completely equipped all their production space. It required three 333 kva., 13,200 volt transformers for the 440-volt motors, and three 150 kva. transformers for the 120/208-volt 4-wire lighting system.

To provide satisfactory illumination, the loom aisles were lighted to the order of 35 f.c. Other processing areas needed 25 f.c., and ordinary work spaces to about 15 f.c. No color corrective units were employed. In all, about 250 branch lighting circuits were installed, of which 50 circuits were No. 8 wire and all others No. 10 wire.

Maintenance considerations were important in choosing equipment. Where lighting reflectors were positioned in floor areas directly beneath the looms, it was necessary to protect lamps from harmful vibration.

Lighting units, in areas where no excessive vibration existed, employed rigid conduit stems with self-aligning fittings. The stem-suspended reflectors were of the twist-out type to permit quick removal for cleaning.

There are 16 power distribution panels. Here a design was chosen which permits the removal of all parts without taking off the cabinet front. All lighting branch circuits employ circuit breaker protection. All of the distribution centers were installed with junction boxes directly above them, for collecting the horizontal feeder and branch conduit runs. With this arrangement it will be possible to change partitions and move panels with a minimum cost in rearranging the conduits.

Textiles need conditioned air and this plant's three systems required about 110 hp. in motors. Humidification controls are located in various areas to regulate their respective conditioning units automatically.

Modern equipment for the warping machines, in loom aisles and other departments, required many special controls for motors and for protecting breaks in warping and other operations.

With 600 motors in operation—none over 30 hp.—an investigation was made to determine the power factor conditions. At peak load the power factor was 94 per cent, while during off-peak periods the readings ranged between 80 and 85 per cent. This indicates a careful application of motors.

Signaling equipment of various low-voltage types is employed, and also for general plant operations, there is a clock system, watchman, night lighting and departmental telephones that operate through the main office exchange.

In doing this modernization work, the Batte Electric Company cooperated with the company's engineering and maintenance staff to provide a wiring system that would be economical to maintain. This was accomplished to best advantage by using new materials throughout and abandoning the existing wiring in its entirety.

A Wish for 1939!

THIS 1939—So far it is an unspoiled year! AndI've been thinking what I'd like to do with it, if I could have it to use for the electrical contractor.

Starting with this whimsy, I have been listing things on paper—things that would be good to do—good for contractors everywhere. And before I knew it, it began to take on the familiar form of a program—a two part program, half of which might be considered promotion and half research. And yet it is really all promotion and it is not what we usually call promotion at all. In fact, Part I might better be set down as *Productive Self-Discipline.* And Part II could just as well be headed—*Creative Self Discovery*—just to keep the whimsy going.

In a word, I have put down a few things that ought to be done, can be done, will be done some day to bring more order, peace and profit into this business of electrical construction. I am suggesting that we go to work on a few of the things that contractors all over the country are now cursing at and doing little to correct. And I am also recommending an organized inquiry into some further possibilities that so far have received no real attention. And I am raising the question—why not get going now? And here you are—

Opportunity in 1939.

First Part—To bring immediate benefits to electrical contractors by improving the local conditions under which they do business.

1. *A Drive Against the False Discount Evil—*

Let's set up a local and national movement to unmask unfair discounts and those who use them for unfair purposes. In each locality let's report and publish to all the trade which contractors receive wholesale discounts without performing the wholesale function and use that extra margin against competitors on construction work. Let's individually quit buying from manufacturers who give such discounts.

Let's procede likewise individually against wholesalers who give our functional discounts to the consumer, or let down the bars on quantity. Let's compile such local evidence and mass it regionally and nationally against these weak sisters who thus disturb the economic peace.

2. *A Drive for Rural Inspection—*

Although established by REA in 39 states on government financed farm cooperatives, most areas served by power companies have no inspection of rural wiring. We want it because it improves the quality of wiring, increases adequacy and safety. If local contractors as a group will visit power company heads and urge this reform, they will get action. This action can be speeded by backing the local pressure with statewide and national action. Why not now?

3. *A Drive to Improve Estimating Practice—*

Lack of estimating knowledge and skill is a blight on this business. The cure lies in the establishment of instruction for contractors in every city, to improve their estimating technique, reduce the losses in the business and ultimately lead to the organizing of voluntary codes of fair bidding practice. These classes can be conducted by the contractors themselves.

4. *A Drive to Improve Accounting Practice—*

The same action should be taken to educate the contractor to better business methods, through standard accounting that shows him the truth of profit and loss—and why. The more competent men of every city can profitably support such a course of self instruction for the effect it will have on smaller, less skilled competitors.

5. *A Drive to Reclaim the House Wiring Business—*

Wiring of houses old and new is demoralized by price cutting incompetents, and the public suffers both in quality and adequacy of installations. This business must be re-established on an economic basis and in the hands of contractors of responsibility. It calls for a new sales technique in which a definite proposal and specification, supported by a layout plan, govern competitive bidding. Group action can establish this standard in any city and rewiring of houses can be sold. The Adequate Wiring Program is already bringing national leadership. But to put it over there must be local action.

And a Few Suggestions that Could Make a Pretty Helpful Program for the Electrical Contracting Industry

By Earl Whitehorne

Second Part—To bring immediate benefit to electrical contractors by strengthening their position in the industry.

6. *A Study of the Electrical Construction Business—*

An annual or semi-annual survey should be made to show the total volume of the electrical contracting business, broken down into industrial, commercial, residential and public buildings, rural lines and wiring, motor repairs, industrial maintenance, air conditioning, and other heads, and divided into regions.

This will enable the contractor himself to check his own progress and to prove his accomplishment. It will show his importance as a consumer of products and a seller of markets and provide a basis for calculating the margin he should have in discount schedules.

7. *A Study of the Contractor's Influence in Specifying Products—*

A survey of the number of contractors who actively write specifications for jobs of size, and the influence they exert in the selection of products. Here lies definite evidence of the importance of the contractor as a creator of markets beyond his own buying.

8. *A Study of the Sources from Which the Contractor Buys—*

A survey of the buying habits of the contractor showing from whom he buys, how, when and why. This information laid before the manufacturers and wholesalers will win recognition from these suppliers and show to the contractor himself his opportunities and short-comings.

9. *A Study of the Contractors Function in Industrial Maintenance—*

A broad analysis of the industrial market for wiring and motor repair, the contractors present status in this field. It will mean invaluable experience and disclose new opportunity for development, by indicating how the contractor can function most effectively, for example in relation to the plant staff.

10. *Market Studies of New Fields and New Products Open to Development by the Contractor—*

Trend surveys on new equipment introduced and new applications of electricity as developed, to indicate the opportunity they offer the contractor and how to approach it. Or, other studies to broaden our knowledge of current markets and give us guidance in taking advantage of them.

Such research suggestions may sound somewhat nebulous as you list them down. Unanswered questions immediately arise as to how they would be conducted and how applied. But this is just a matter of organizing. It is done in other fields. We can do it. And that such knowledge of ourselves would be useful can hardly be doubted.

Studies No. 7, 8, 9 and 10 and others that will readily come to mind will not only expose and define the current position of the contractor in electrical distribution. It will disclose to himself his present strength and weakness and opportunity. It will provide a basis for establishing the contractor in a better position in the economics of the electrical industry.

As we consider the possible expansion of such a program of promotion and research the vista broadens and the shadow raises. For if we could improve the local conditions under which the electrical contractor works—if we could explore the business of electrical contracting and provide more accurate knowledge of its economic, marketing, labor, legal and other aspects—if we could do these two things, we would not only help the contractor, but the wholesaler, the manufacturer, the power company—the whole electrical industry. And the public would benefit in turn.

There is no reason why there should be this dearth of national statistics of our contracting industry. But because there are none, the influence of the contractor on the electrical market and the possibilities for the development of the contractor as a creator of markets are unknown. As a result, the position of the contractor in the electrical industry is indefinite. This affects both the distribution policies and marketing plans of many products.

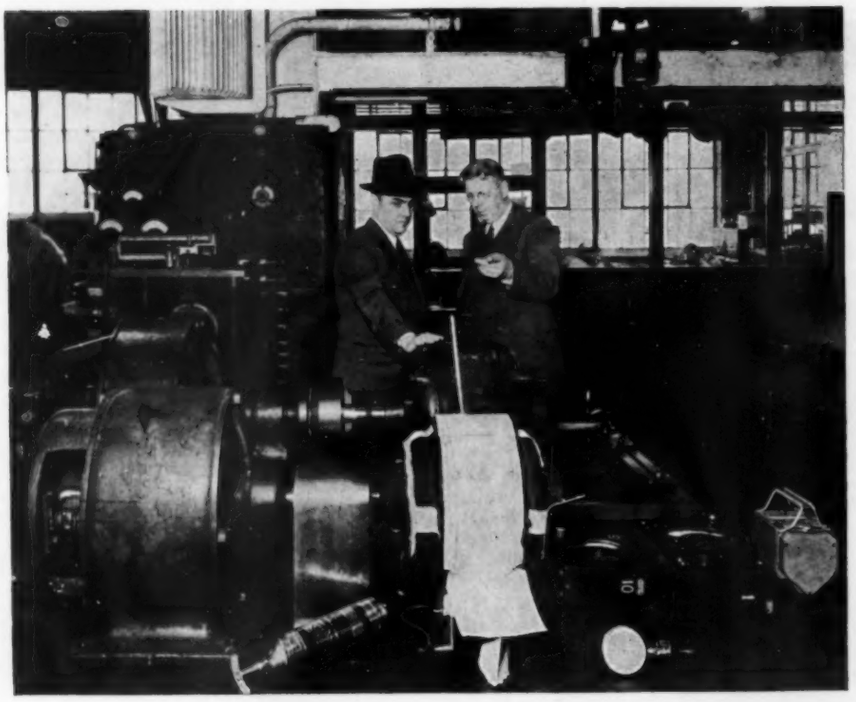
So the contractor suffers from neglect, or discrimination, in trade policies. And this is probably as unfortunate for the manufacturer and for the wholesaler as it is for him. If I could make a wish for 1939, therefore, and make it stick, I would choose some such program as the big job for the year ahead.

We are local minded individualists, we contractors. We do not naturally turn our minds to this kind of background work. But it has become vital to our industry today. We have stuck to our individual knitting a bit too long and the yarn is snarled, because so many other people are now interfering with us. We've got to comb it out and in the future keep it in order. And that goes for everybody.

And, after all, it is a job for local minded men, because it must be started in the home town—by a local group—then coordinated nationally. And the procedure is as simple as the town meeting which made America what it is. I set down these suggestions, therefore, not pretending that I have selected the first things to do in any community or the most important. I have just listed some examples, believing that they indicate, perhaps, what kind of thing we should do to take the next step in our progress.

New Heat Levels for Windings

How Spun Glass Insulation Meets Tough Conditions for the Motor Service Shop



PERFORMANCE TEST — *A gruelling overload being put to a spun-glass-wound motor on the test stand.*

By R. M. Hukle, E. E.,
Anaconda Wire & Cable Co.

THE life of most electrical apparatus is governed to a large extent by the temperature its insulation will safely stand. Heretofore, asbestos was the only material which would survive conditions of extreme temperature. Cotton, silk, paper could be easily burned out.

Recently this problem of insulation has been greatly advanced by the advent of an old material in a new form —spun glass. For approximately a year and a half ago Anaconda saw the possibility of using small spun glass fibers as a covering for magnet wire. And after lengthy and exacting laboratory tests, we succeeded in producing a glass-covered magnet wire, which was given the trade name, "Vitrotex".

This wire has now been subjected to all kinds of tests, in an effort to approach actual conditions to which the magnet wire would be exposed in commercial use. Glass insulation we find very resistant to high temperatures. It has a melting temperature of approximately 2,400 deg. F. It is fireproof, moisture proof, inorganic, non-hygroscopic, and acid-resistant. Therefore, it is ideal for electrical equipment. Some further technical advantages of spun glass insulation are: High leakage resistance in high relative humidity, good power factor, fast cooling of coil mass, and ability to withstand high frequency and high-voltage stresses.

Here are some actual records of performance of spun-glass insulation—

1. A 3 hp., 400 volt, 3 phase, 60 cycle, re-wound motor was subjected to a hundred percent overload for 50 hours. By restricting the ventilation, the windings reached a temperature of 700 deg. F., and remained at this temperature for the duration of the test. At the end of 50 hours the motor was still operating satisfactorily.

2. A re-wound valve coil has been in operation for over four months and has operated perfectly at a temperature of 525 deg. F. Tests made at intervals have shown no sign of short circuits.

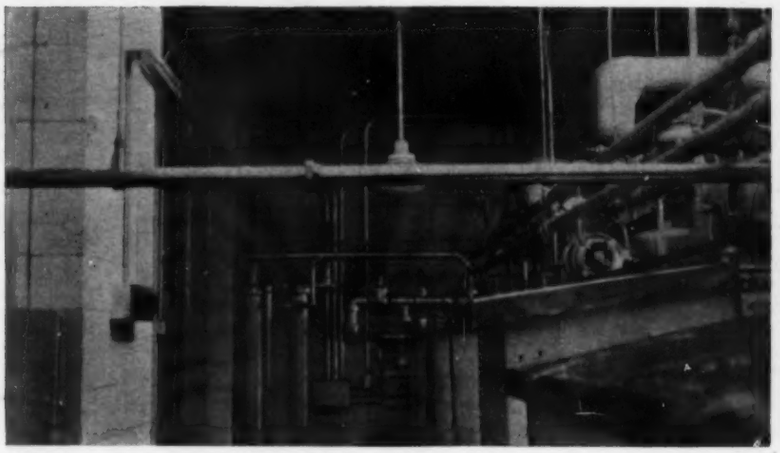
3. Other re-wound coils when tested in the laboratory have been operated for over 300 hours at a temperature of 1,000 deg. F. They were removed without failure and showed no evidence of short circuits when tested on a very sensitive short-circuit detector.

In manufacturing glass fibers, alkali-free glass is used to produce a very flexible strand, averaging about .0002 diameter. There are two types of fibers available, the "staple", 8 to 15 in. long fibers, and the "continuous" fibers. The staple fibers are produced by forcing molten glass through tiny holes in the base of a melting crucible, using terrific steam pressure.

The continuous fibers are produced from glass marbles about ¾ in. in diameter. These marbles are automatically fed into an electrically heated crucible having 102 tiny holes through which the molten glass emerges by gravity. The tiny filaments are combined into a

(*Continued on page 69*)

CLEANING *these milk storage tanks twice a day, workmen are protected from accidental starting of agitators by a lock-off feature on the stop button.*



LOCKOFF BUTTONS *control the 1 horsepower motors driving agitators in a group of Jensen vats used for pasteurizing, cooling and grading cream.*

Lock-Off CONTROLS FOR SAFETY

Where Men Crawl Into a Machine to Clean It, Make Sure the Motor Can Not be Started

By Paul E. Patrick
Chief Electrician
Bowman Dairy Co., Chicago

EVER since the fire insurance underwriters began formulating rules governing electrical material and construction, the two main considerations have been fire hazard and protection against accidental contact with live parts. Probably these two points always will be the most important ones to be covered by these rules. However, another angle of personal safety has more recently been given a good deal of attention, and rightly so, on account of the tremendous increase in the use of individual motor drives. I refer to the safety devices designed to prevent motors on machines from being started while men may be cleaning or making repairs or adjustments.

In dairies and other food plants, it is common practice after the day's run to thoroughly clean and sterilize all of the equipment. There is a good deal of this work, such as cleaning the inside of storage tanks containing motor driven agitators. This job is very hazardous, without some means of making sure that the motors will not be started until the work is finished. We have had no serious accidents, but we have come just near enough to it several times to make us realize that something should be done about it. And because we have 24 buildings in the Chicago area and over 2000 motors to protect, this was no little problem.

Manually operated motor starting switches and the push buttons of the magnetic starters can be provided with attachments for locking them with a padlock. It is also quite simple to remove the fuses from the circuit. Either of these methods will provide adequate safety. However, while satisfactory and quite generally used in plants having a comparatively small number of large motors, I do not consider them feasible in our plants where we have so many small motors and where every machine is individually driven. In our plants this procedure would have to be repeated a hundred times a day.

At some of our Wisconsin plants, we have recently installed some of the newer types of dead front power distribution panels, which have some very excellent safety features. Circuits can be disconnected and fuses removed at one simple operation. But as a means for killing the circuits during the cleaning-up operations it is not satisfactory, because it is too much trouble when it has to be done so often.

Right here I would like to call attention to the distinction between two quite different requirements; first, to provide safety to machinists repairing machines or electricians repairing the electrical equipment; and second, to provide safety to the operator of the machine. In the first instance the work is done at such infrequent intervals that it would not be considered any trouble or inconvenience to padlock a switch or remove fuses. In the second instance, where the occasion arises every day or several times a day, an entirely different safety method is needed.

It seems to me that the procedure requiring the fewest possible motions and the least effort on the part of the workmen, while it may not provide quite as near 100 per cent safety, would have the greatest over all effectiveness. For it seems to be human nature to take a chance rather than to go to any inconvenience to protect ourselves.

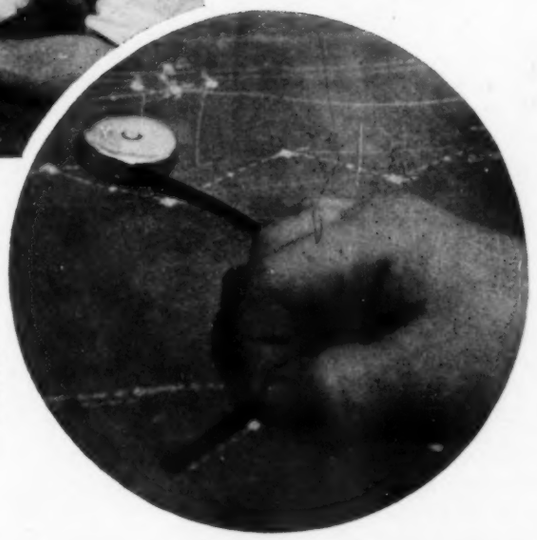
We use magnetic starters almost exclusively in all of our plants. I believe that where it is daily routine for men to do such cleaning tasks, the most practical means of providing reasonable safety is the locking type of push button. And the ideal procedure, and the one that should be taught is that the man who locks the circuit should always unlock it when he is through.

In wiring these buttons, an electrician will know, of course, that the stop wire from the starter should always go to the proper post on the button—not the common. In case there are several buttons controlling the same motor, one lock button can be so wired as to lock the whole circuit.

Making Estimates Control Jobs

How good procedure speeds estimating, saves errors, and smooths out problems for the job and office.

By
J. Dandelake, E.E.
Miller Electric Company
Jacksonville, Florida



START RIGHT—*Initial take-offs and entries pave the way to smooth performance. J. Dandelake offers some suggestions in this article.*

TAPE MEASURING—*Actual footages by ¼-in. scale or by ⅛-in. scale appear on this steel tape. Conversion errors are avoided.*

ELECTRICAL estimates can be made of far greater value to the contractor than merely the means of bidding on a job. When a definite well balanced procedure is adopted, jobs can be estimated accurately and speedily in a manner that leaves a complete record for handling the job without confusion. Every estimate can be arranged to speed up ordering and shipment of the correct materials, and the weekly comparisons of labor progress.

Estimates, of course, usually evolve from these nine conventional steps:

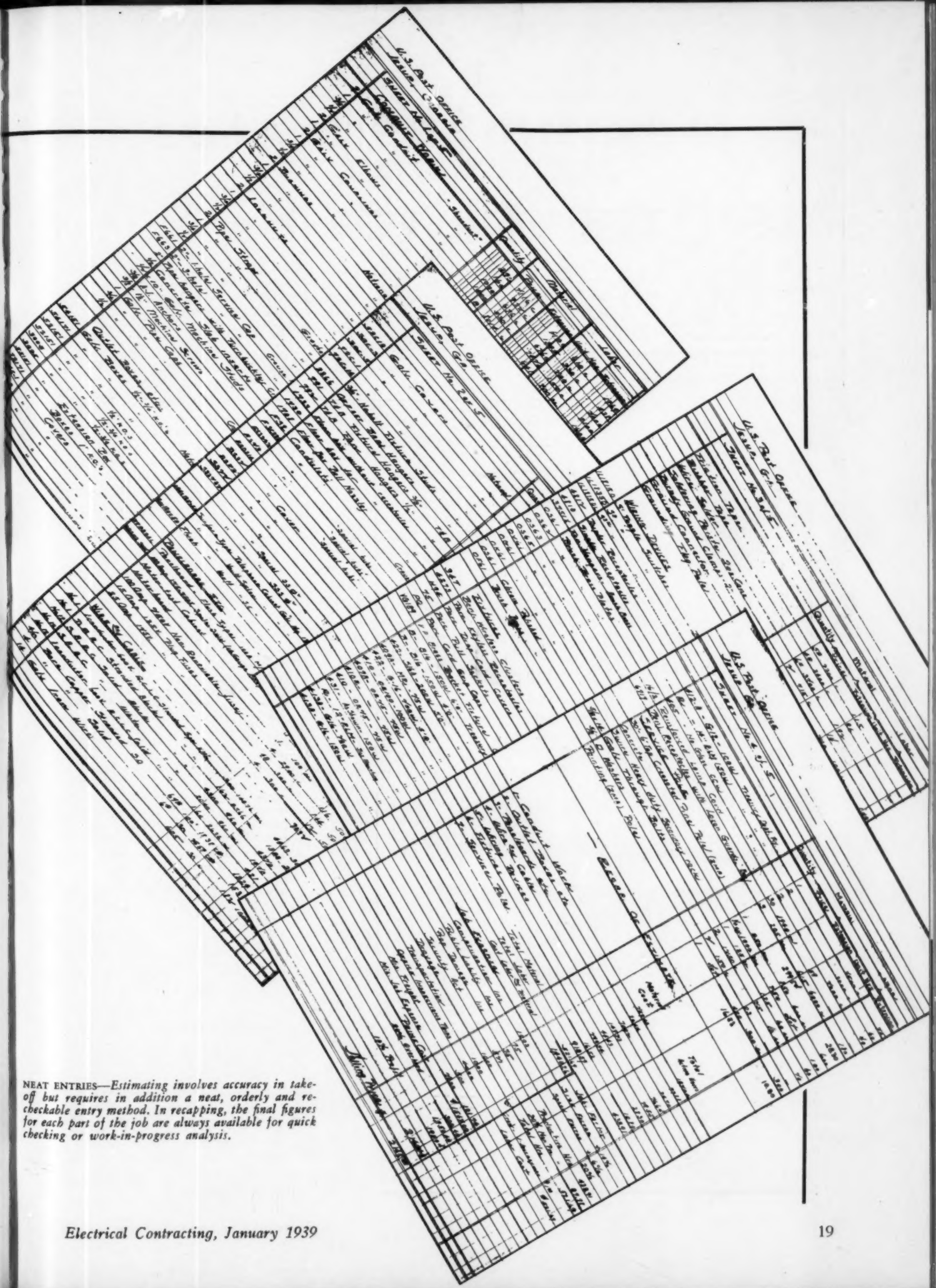
1. Preliminary study of job.
2. Layout of system.
3. Take-off of quantities.
4. Recapitulation of work sheets.
5. Write-up of items.
6. Pricing and extension of labor and materials.
7. Summary of prime costs.
8. Setting up job expense.
9. Final marking up to determine selling price.

Without attempting to discuss the broad subject of labor units or the details of the foregoing nine logical steps in estimating, we have found that certain improvements can be made in the usual estimating procedure. They bring us worthwhile benefits and in no way upset the estimator's normal methods of doing his work. In the main, it is largely a matter of establishing a set style and sequence and following it religiously for every estimate.

These methods have resulted from years of experience in estimating a wide variety of electrical jobs, ranging in size up to $500,000. During this time, inaccurate habits and practices were weeded out, cumbersome and tedious procedure was tested and abandoned, and the more or less conventional methods improved upon. The following technique has evolved as illustrated in the accompanying work sheets of a small post office job taken from the daily run of estimating work.

Take-off Procedure:

1. Before starting a take-off, the plans and specifications are studied. Separate notes are compiled of special conditions or requirements. Quotations requested for equipment.
2. Jobs are laid out on the plans in crayon indicating how they are to be installed.
3. Outlets are taken off and posted in full detail upon a work sheet, before branch circuit runs are measured. The various outlets are counted twice with a tallyometer. On first count the symbol is marked slantwise with red crayon. On the re-count an opposite slant-check forms a cross over the symbol—a check on fully counting the outlets.
4. When a blueprinted layout is measured, each measured run is covered with a red crayon line. In measuring runs on plans laid out with crayon, these lines are erased after being measured.
5. For speedy erasing a motorized eraser is kept right on the estimator's table.
6. Measuring of runs is done with a Lufkin steel tape instead of a rotometer. This tape has a ¼-in. scale on one side with an effective length of 240 feet, and a ⅛-in. scale on the other side with an effective length of 480 feet. Since the measurements made by the tape give actual footage, it is

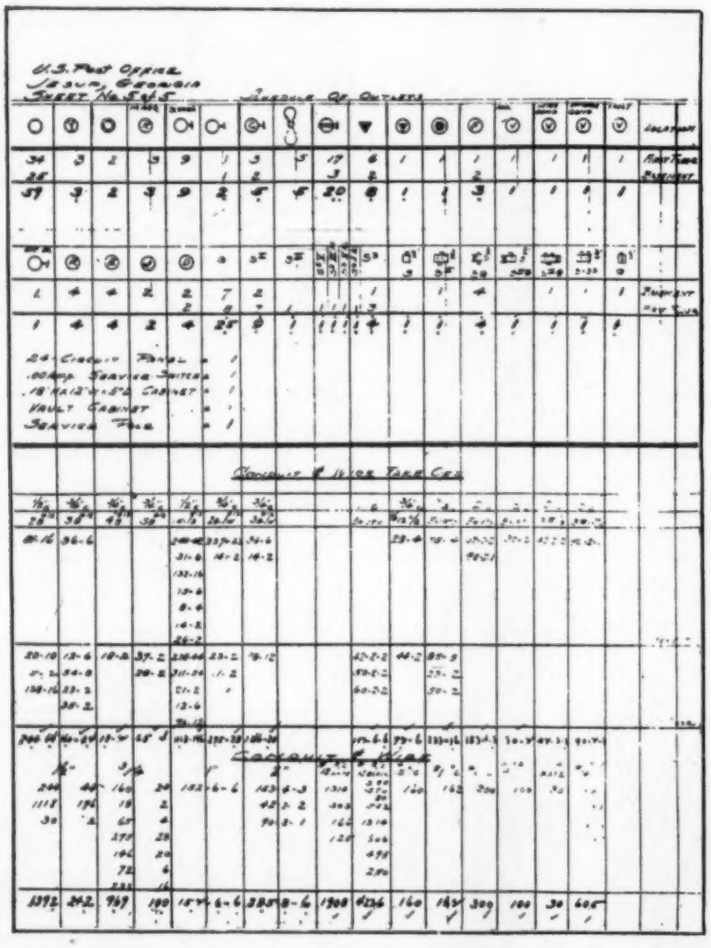


NEAT ENTRIES—*Estimating involves accuracy in take-off but requires in addition a neat, orderly and re-checkable entry method. In recapping, the final figures for each part of the job are always available for quick checking or work-in-progress analysis.*

THE HIGH SPOTS OF ESTIMATING

The twelve essential steps, according to the experience of one of the busiest estimators in the south.

1. Make careful preliminary studies of job conditions and layout.
2. Prepare accurate take-offs based on actual conditions of installation.
3. Develop a simple code of check-offs and re-checks to prevent omissions or duplications.
4. List all items by catalog number to assure correct pricing and ordering.
5. Prepare all material lists in the order of shipments required on the job.
6. Segregate labor estimates to simplify weekly work progress comparisons.
7. Save all special notes and memoranda while entering to the work sheets, for final review in winding up the estimate.
8. Be neat and orderly throughout the job.
9. Post every entry and extension, so it can be easily rechecked, and clearly indicates having been re-checked.
10. Make careful estimates of job expense and compare them with actual costs on previous work.
11. Avoid doing a rush job on the final recapitulation of estimate.
12. Maintain good estimating data, practical estimating forms and helpful estimating tools.



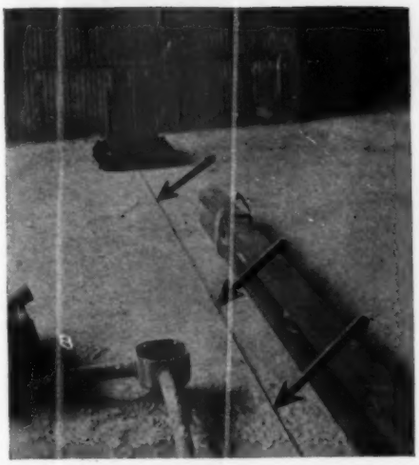
WORK SHEET *posting methods permit using condensed entries for this two-story structure. Every type of outlet is counted before conduit is measured. Column totals are written in red crayon. Conduit take-offs include footage, L's, locknuts and bushings. Black and white wire are listed separately.*

not necessary to convert scale readings to footage. Time is saved and errors of multiplication are avoided.

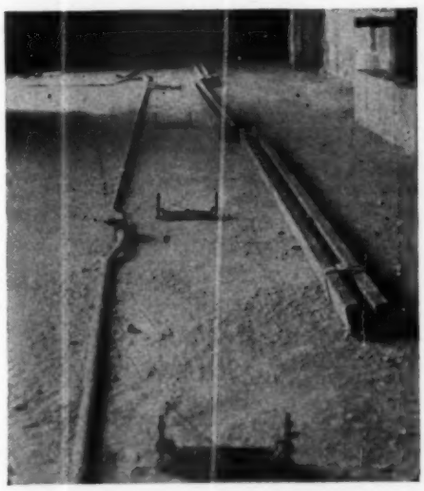
7. Since the conduit and wire take-off is made after all outlets have been counted and scheduled, the estimator has less detail work to enter while measuring the various runs. Therefore, the branch circuit conduit and wire is taken off and entered with the feeders, and is summarized as shown at the bottom of sheet No. 5.
8. Pricing sheets are written up after all columns of the work sheet are totaled in red crayon. Items are are brought forward and listed under separate headings of material similar to their order of shipment to the job. Pipe and boxes are listed first, then covers, condulets, panelboards, wire and cable, tape and solder, wiring devices, fixtures and service pole. All extensions are made with a calculating machine and checked with a slide rule.
9. Each section of the pricing sheet is separately totaled in red crayon and these sub-totals are recapped on the last pricing sheet. The record thus provides separate costs of each class of material and the active labor involved.
10. The completed sheets provide a clear record of all materials by their correct description. From them all orders may be placed during the progress of the job, estimates for payment may be readily prepared for the roughing-in work, and all later operations and the labor sub-totals are available for a weekly check-up of work progress.

Some estimators will disagree with the form employed for work sheets, and in the sequence of listing materials. However, this system has often aided us in handling a large amount of work accurately for the Miller Electric Company. Jobs come and go, and they must be carried out efficiently according to the original estimating records, after they are secured. The preparation of careful estimating records at the outset has paved the way to smooth job performance at all stages of completion and insured the profit.

Planning an Underfloor Installation



SPOTTING JUNCTIONS—*From detailed dimensions, end junction boxes are located along chalk lines that establish the runs. Lengths of duct are distributed along the runs.*



DUCTS ARE LAID *and wired down in the supporting saddles, then the standpipe outlets leveled with junction boxes. A power hacksaw cuts odd lengths of raceway required between outlets.*

CAREFUL planning simplifies the installation of underfloor raceway systems. It is a step-by-step job, as is shown by these pictures taken during the installing of 35,000 feet of metal underfloor raceways in the new Cincinnati Post Office. The work, as done by the Arthur Bertke Electric Company of Cincinnati, illustrates modern practice in handling duct jobs.

The layout was designed to carry telephone and signal wires through office areas on eight floors. Typical runs consist of two parallel metal ducts $2\frac{3}{4}$ by $1\frac{1}{2}$ inches in crosssection. To provide maximum future accessibility, standpipe openings were placed every 24 inches along the ducts. About 400 standpipes and 546 junction boxes were installed under this contract.

Following closely upon construction schedules, an 8-man installation crew handled one floor a week, making all conduit connections and mounting various cabinets.

This procedure is interesting because with applications for underfloor installations now extending to smaller jobs more contractors will need to do step-by-step planning for such work.

JUNCTION LEVELING *to exact finished floor level requires accurate methods. A simple water level comprising two glass tubes and a 25 foot connecting hose, establishes the floor level from door thresholds.*

TRIMMING UP *after floor sleepers are laid. Junction boxes are leveled, duct lines checked for injury or displacement. Last chance to catch defects without resorting to a chisel and hammer.*

DUCTS FASTENED *with fibrous screw anchors spaced along the chalk line on 8 foot centers hold duct saddles in place. Accurate and speedy line-up in duct laying also simplifies locating standpipes later.*

WATER-PROOFING *compound seals couplings and joints. Junction boxes are grouted in place where subject to injury during floor work. Conduits carry power conductors to separate floor boxes.*

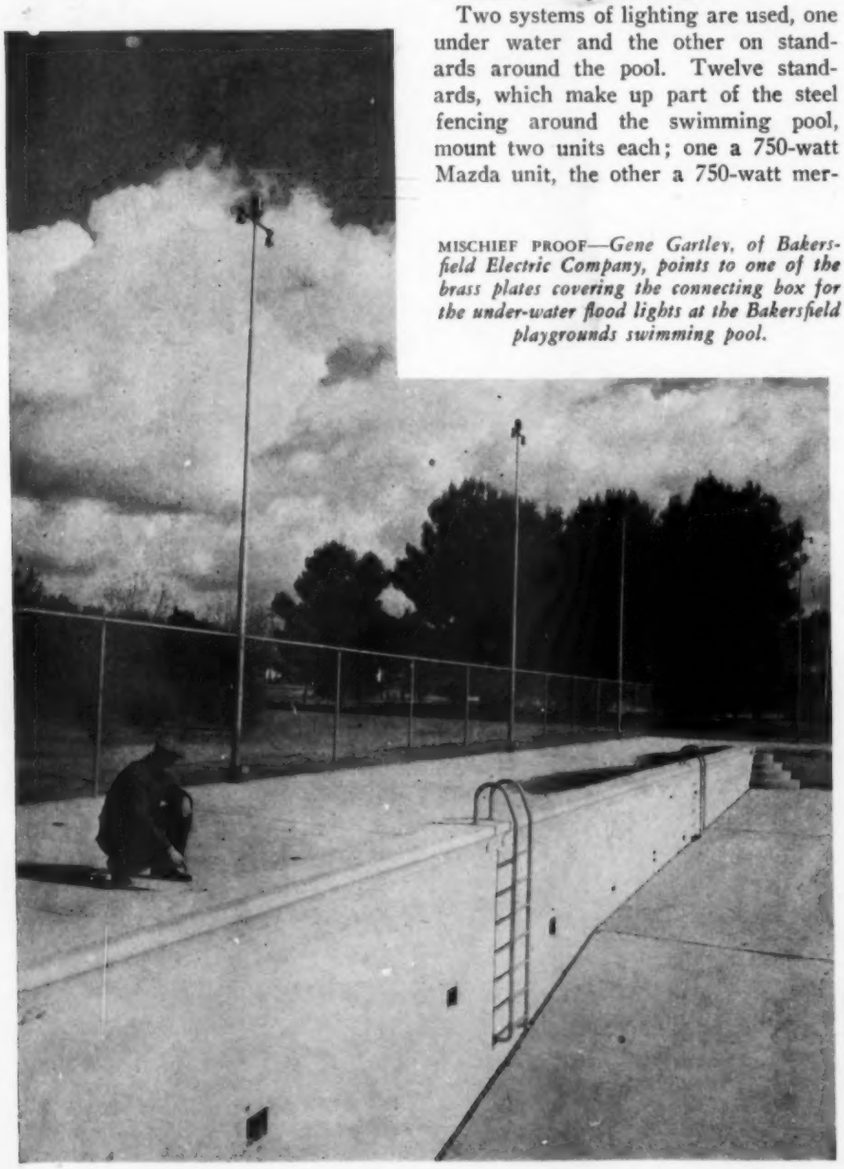
Ready for Bad Boys

Playground equipment often comes to grief while unwatched during the winter. But Gene Gartley found ways to make the swimming pool installation safe

PROTECTION of public equipment from the vandalism of small boys with air rifles or a fairly good aim with a rock, is a problem with which public officials of most cities have to contend. The city of Bakersfield, Calif., provides excellent play facilities for its youngsters, but it also takes care to minimize the possibility of damage during that period of the year when equipment is not in use.

Gene Gartley, of Bakersfield Electric Company, recently installed a unique lighting system for a large swimming pool at one of the public playgrounds of that city. It provided for removal of the equipment during the winter season so that the small boy with his slingshot would not break it while it was not under supervision. City electrical inspector C. R. Meikel designed the installation, to which Mr. Gartley added a number of special ideas.

Two systems of lighting are used, one under water and the other on standards around the pool. Twelve standards, which make up part of the steel fencing around the swimming pool, mount two units each; one a 750-watt Mazda unit, the other a 750-watt mercury vapor unit, each in refracting glassware. The transformer for the mercury unit is ingeniously mounted at the very apex of the standard. The standards are made up of sections of steel pipe swedged together, galvanized and then imbedded in the concrete walk surrounding the pool. Mr. Gartley drilled into the base of each pole, tapped the hole and fitted it with a ¾-in. nipple connected to the back of a weatherproof pull box, with gasketed cover. This box, is about 4 in. from the concrete walk so that water used in washing off the walks will not get into it. The box was used in connecting feeds to the lighting units above.



MISCHIEF PROOF—*Gene Gartley, of Bakersfield Electric Company, points to one of the brass plates covering the connecting box for the under-water flood lights at the Bakersfield playgrounds swimming pool.*

Under-water units are Westinghouse submersible type, so arranged that they may be disconnected by means of a twist lock plug in a waterproof receptacle and the entire unit withdrawn from the concrete housing. Brass plates fitted with gaskets, in the face of the walks, provide access to connections between these units and the wiring system.

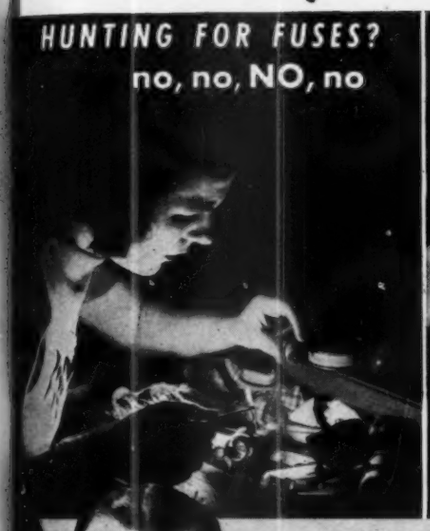
Control of the lighting is centered in the water purification room under one end of the swimming pool area. A 200-amp. main switch distributes through a 12 circuit multibreaker panel to the individual 30-amp. lighting circuit. An underground feeder brings service from the pole at the street, some distance away through the park, into the swimming pool plant.

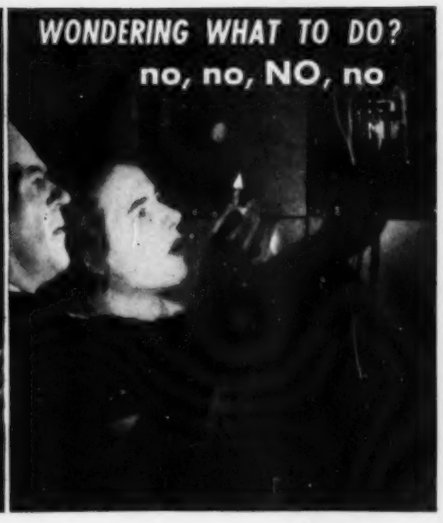
Because of corrosive conditions in the soil an ingenious method was used to protect the underground conduit. A 6-in. case of oiled sand was tampered hard around the conduit to protect it from the adjacent corrosive soil. This oiled sand, when it cools and hardens, becomes somewhat like asphalt paving and provides good protection to the conduit at a nominal cost.

Lighting glassware, lamps, and the underwater units are removed at the end of the swimming season and stored. Even the glass plates in front of the underwater units are removed and wooden covers substituted. These had been broken by the marksmanship of the small boys, as shown in this illustration, but no damage had been done to more expensive equipment.

WHERE

was Mary when the lights went out?





—not Mary, thanks to

THE CUTLER-HAMMER MULTI-BREAKER

A blown fuse can be such a nuisance . . . and usually is. Just when the guests are called to dinner, or just after you've settled down with a thrilling new book, or just when your favorite radio program comes on . . . doesn't it seem those lights *always* go out at just the wrong moment?

You can avoid so much of this trouble with a Cutler-Hammer Multi-Breaker. It's just a neat panel on your kitchen wall or in some other such easy-to-find spot. No stumbling down-stairs. No hunting matches or candles. In fact, you need not even hunt for a new fuse, not to mention finding which one is blown. For all you do to reset a Cutler-Hammer Multi-Breaker is to push up a little lever and the lights are back on. Call your electrician or electric company *now* and let a Cutler-Hammer Multi-Breaker end forever the nuisance of blown fuses in *your* home. CUTLER-HAMMER, Inc., *Pioneer Electrical Manufacturers*, 1306 St. Paul Ave., Milwaukee, Wis.

CUTLER-HAMMER
MULTI-BREAKER
C-H

Another of the new series in National Magazines . . . reaching your customers. C-H Multi-Breaker sales are rising steadily. Climb on . . . and go to town!

This is **YOUR** Advertising

Editorials

Earl Whitehorne, Editor

Such a New Year!

And while wishing you a Happy New Year, certainly this one has its points. For the electrical contracting business rides largely with building construction and look at the dope—

The forecast is for 40 per cent more residence building in 1939, 30 per cent more factory construction, 15 per cent more commercial work. And of the $689,000,000 Federal Housing program already ear marked, only $25,000,000 has been contracted for.

There is a lot of wiring ahead! And more re-wiring than anybody knows. And on top of that general business is better and promises more. It should not be hard to make this a Happy New Year.

More Plug-In Trouble

Right now New York City inspectors are plagued with ads offering 1650 to 2500-watt portable electric ranges. One manufacturer's literature is said to stress its products as being suitable for "cooking where you are in any room or part of the house." And in large type, "Just Plug into Any Convenient Outlet". The device, "cooks, bakes, broils, boils, roasts, fries, in fact cooks and bakes a complete meal at one time."

Consider the prevailing vintage of bottle-neck wiring, the frayed and already "baked and broiled" fixture conductors, jumpered fuses and so forth, to be found anywhere. Here then is just one more headache for our vigilantes of electrical safety. Quite naturally the New York Bureau of Gas and Electricity has issued a bulletin which warns that its inspectors will not approve such a unit if it is plugged into any convenience outlet. The bulletin makes no mention of using fixture sockets as plug-in outlets. But we'll bet a 1939 straw sailor that a big percentage of these "do-it-all" ranges are used in that manner. Meanwhile, Voltaire and Ampere turn over in their graves.

A 20-Year Wiring Plan

Those Russians started it. Now the air is full of 5-year plans, 10-year plans, and plans for $30 every Thursday. And one Adequate Wiring salesman in Pasadena has hit on a 20-year plan for full comfort wiring.

This chap, Bill Gibbs, goes to people who are building a new house, financed by FHA. Most FHA terms run for 20 years. So he divides the total cost of a first class wiring job by 20 years and tells the prospect that for so much a year, during his purchase contract, he can have electricity for every use and convenience.

On this 20-year plan, even a $300 wiring job for a small house only runs to $15 a year. And it is easy to sell. It is an idea worth pushing everywhere.

Realities of Plant Service

Utopia for the electrical contractor would be a city where all plants, regardless of size or product, employ contractors and motor service shops for every electrical repair and installation job. But it isn't as simple as that. Observations reported from four industrial cities show it clearly. Therein lies a challenge for those who seek business from their local factories.

All plants have their particular electrical problems, some serious and some minor. Some troubles can wait for outside help, but others need immediate "fire department" attention. Still, in many larger plants outside service organizations are hired for the tough jobs—and many of the easier ones too, according to the speed, skill and efficiency they show.

So for the contractor the real answer rests in finding the jobs he can do better, and how this service will simplify the work of that plant's own maintenance staff. There are good jobs to be had if you will help them out.

Builders to the Mike

As wage scales climb, smart builders strive to plug lost-motion leaks. A New Jersey builder does it with sound equipment. For example, a large apartment housing project near Plainfield, N. J., was provided with a "mike" in the central office, and five loudspeakers at strategic points, supplemented with weatherproof inter-comm. telephones placed near each speaker. This arrangement saves dozens of trips for job foremen and engineers as the work moves along to completion. Here is an idea saleable to larger jobs in any town. It means meat for the sound-wise electrical contractor.

Just Smart Teamwork

Here is a brief story of three-party loyalty between a contractor, one of his foremen and a plant customer. It emphasizes the value of good customer and employee relations. A plant executive told it. It seems that after the contractor had completed wiring this company's plant, the firm wanted to hire the electrical contractor's superintendent, to head its electrical maintenance staff. All three parties mutually agreed it was a logical step to take.

But the foreman on his part insisted that this contractor was to have first consideration in all future purchases of electrical supplies and equipment and all new construction work. The agreement was made about eight years ago and everybody has been happy to this day—all three parties told us so. Evidently this contractor knows how to get along with customers and his staff as well. He is smart.

Taverns Are Guinea Pigs

Fifty million Americans, who can take it or leave it alone, decide to take it more or less frequently. To slake the native thirst needs more taverns, inns, cocktail lounges and nightclubs

than we care to contemplate of a Sunday morning.

However, the average rounder has gone high hat. He demands the privilege of sliding under the table amid the elegance of chromium plate, pastel hued leather and concealed lighting, at no extra cost.

So the tavern owners, always on the lookout for new ways to attract customers, beat off competition with striking decorative effects, and new lighting schemes. And the lowly tavern has now become a proving ground for lighting ideas.

The average job may not add up to much in dollars but the contractor should give it more than ordinary attention. This new lighting shows the all important general public what the modern decorative technique can do with illumination.

Ask the Contractor

A national magazine article said the other day—"When a man builds a new house or remodels an old one, where is he going to get help with his lighting problems? There is nobody but the power company."

That might have been a poser ten years ago, but there is now a growing number of electrical contractors organized to handle home lighting with full understanding of modern illumination technique. Not only in the home but also in commercial buildings and industrial plants, the electrical contractor is speaking authoritatively about lighting.

This is a perfectly natural development. Who else is in such a key position to give completely unbiased advise and to see lighting problems from the broad standpoint of both light sources and wiring? And this view of the whole job is vitally necessary, if carefully engineered lighting equipment is to operate at its intended efficiency.

Break Down Those Cost Barriers

Some of our well-meaning contractor-salesmen back down when Mrs. Jones becomes alarmed that additional outlets might tend to build up her light bill. Maybe more modern electrical ideas would register if a few simple facts were generally known. Recent studies indicate that about 2 per cent of the average family budget goes for electricity. On the other hand food takes 33%, sundries 30%, housing 20%, clothing 12% and fuel the remaining 3%. Many families pay out more for cigarettes than for electricity, twice the amount at drug stores, three times as much at filling stations.

Those who sell and install electric ranges should note the outcome of two recent surveys. One thousand persons with non-electric kitchens estimated it would cost from $5 to $35 per month to cook electrically. Of 1284 electric range owners questioned in all parts of the country, their average actual cooking cost was $2.30 per month. And 80 per cent said less than $3 per month.

Maybe some of those figures will help break down an important sales barrier. Since adequate wiring holds the spotlight, don't let vague objections spoil a sale.

Spotlighting Misused

Reflector type lamps have provided store owners with a simple means of highlighting window displays. No expert installation is required and they are proving an easy item for the contractor and dealer to sell. But some caution ought to be exercised against over-selling the idea. The reaction of some independent storekeepers has been to rely entirely upon the virtues of spotlighting—with economy the object.

The theory of window lighting is an old story—first a high general level of illumination, then spotlighting to center attention. But we sometimes forget that the customer is not so well informed. If the spotlighting sales talk ignores other basic window lighting principles, he naturally jumps to the conclusion that window spotlighting is a substitute for general illumination, rather than a sales producing supplement.

Back Talk

Interpretation

To the Editor—I have worked under seven different inspectors and no two of them inspect any way alike. They all have the same code to go by, but do not read it alike. And I do not read the same as they do. On one side of the dividing county road, they accept one thing, while on the other the inspector wants it done different, while where I live neither one will be accepted. How in HELL can we tell what to do to satisfy them all?

One inspector will open all joints, tear your work all to pieces, while the other fellow will try a few switches, ask a few questions, O.K. the job and go on. I know of some jobs that were never inspected and the owners have current. I had to drive 12 miles to remove two screws that were not rust proof. In another case the inspector tried several switches, went to the bottom of the cellar steps, shot his spot light around, asked who did the job, and said O.K. Why do they not have schools, teach them all alike, then let them tell us or better still allow us to attend the same meeting as the inspectors do? Then we would do the work somewhere near alike.

J. E. Judd
Otsego, Michigan.

Why not arrange a series of meetings, Mr. Judd? Get the inspectors who are in authority in the territory you serve, together with all the contractors, and discuss some of these conflicts. It might well lead to agreement on the rules that make you the most trouble.

Public Relations

To the Editor—There has just come to my desk your editorial **"Our Big Idea."** The way you have developed your presentation by showing the progressive growth of ideas, brings your thoughts relative to employer, employee and public relations to a forceful climax.

As one who took the lead at Los Angeles in '37, for the establishment of a new labor section within the framework of NECA, your article is an inspiration. It should be read by every electrical contractor, and I am sure if this was done, there would be a great increase in the national association membership.

Robert A. Goeller
New York, New York

Your interest in this neglected theme, Mr. Goeller, is encouraging. It is becoming steadily more vital to all contractors—large and small—and yet it receives so little thought. We too believe that this field of human relations is a major problem for our industry and its association. We believe the new NECA Labor Section will render valuable service.

Wiring Plans Needed

To the Editor—I noticed your item on the inspector at Miami who is working on the idea of getting architects to make plans and specifications for every electrical installation. This is just what I have been trying to get them to do for the last twenty years. I cannot see how any contractor can send his workmen on a job without giving them some sort of a wiring plan to work from. And if a plan is made the customer should see it, as a basis for selling him more outlets if possible.

With all of this urge for building modern homes, by the Federal Government, it seems to me that we ought to help out by trying to get the electrical work properly engineered, and a representative plan and specification handed to the contractors to bid on. A copy should be sent to the Inspection Department as the architect's and owner's intended installation, with the request that the Inspection Department see that the work is installed in accordance with said plans and specification.

Of course, the inspector says that there is nothing in the underwriters rules or the city ordinance that tells the inspector he must ask for the owner's requirements in the shape of a wiring plan or specification. But there is no excuse for the electrical industry being content to have all inspection done on the minimum basis, regardless of what the owner desires and may have shown on a wiring plan that he expects.

Fred B. Adam, President
Frank Adam Electric Co., St. Louis.

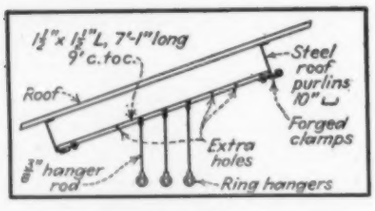
There can be no argument against this, Fred Adam. It is common sense and only justice to the customer. And it is time we made it all definite. A wiring plan for every job is the best possible protection against the competitive bidder who tries to chisel down the total number of outlets.

WIRING Methods

BETWEEN TRUSS SUPPORTS

Steel frame factory buildings require careful planning by the electrical contractor to provide suitable supports for large feeder conduits run overhead. But usually the fireproof roof construction does not lend itself to attachment of fastenings.

ROOF PROBLEM—Steel headers between roof purlins provide between-truss supports for feeder conduits.



NO DRILLING — Shop fabricated headers and clamps permit easy erection for conduit crews.

A typical example is shown in a new Philadelphia bakery plant. Here the Utilities Engineering Company had long runs of 2-in. to 3½-in. conduit to support overhead. The problem was to find a practical means of fastening between trusses.

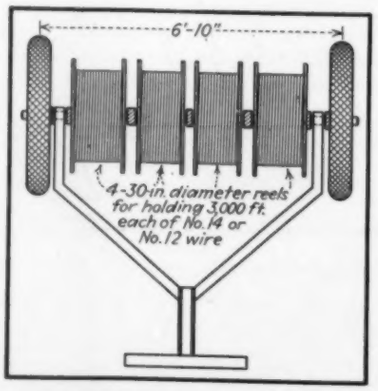
Conduits were run upon the lower chords of roof trusses and bolted to them with U-bolts. Two intermediate supports were installed between trusses to relieve the conduit of sag weight. These supports consisted of ½-in. ring hangers and hanger rods that were suspended from a 7-ft. header of 1½-in. by 1½-in. angle iron. The headers were fastened to channel iron roof purlins.

Clamps were made from 1½-in. flat iron by which the prefabricated headers were installed, without having to drill any of the purlins for fastening bolts. Once the headers were installed, the conduit could be supported in correct alignment, even though the headers sloped at an angle parallel with the fireproof roof.

SAVES WIRE TOTING

By purchasing small wire in 3000-ft. reels instead of standard coils, and racking these reels on a rubber-tired payout trailer, the Electro Construction Company of Philadelphia has simplified wire pulling for small school jobs and the like. The outfit can be rolled around easily on the job and on some jobs the wire was pulled from outside the building.

This convenient means for handling 3000-ft. reels of No. 14 or No. 12 wire, saves time in handling small quantities of wire, and with less waste and kinking. This equipment was also recently found very helpful on a large housing project where many small building units were involved.



WIRE BUGGY—Used with 3,000-ft. reels of small wire to eliminate handling small standard size coils.

Reels are mounted on an axle having a pair of automobile wheels 6 ft. 10 in. apart, with 4-in. wood spacer blocks between the reels. There is a braced tongue for guiding the trailer, or for hooking it to a truck when moved between jobs.

KEEP SMALL ORDERS SHIPSHAPE

Service calls and small wiring orders need not get in the contractor's hair, says U. C. Nolte of Belmonde, Iowa. A short-form record handles this type of business quite accurately, saves bookkeeping time and larger office forms. When the job is complete there is also a permanent record of what was done, by which workmen, for whom, and for how much.

JOB SLIP

LABOR RECORD			AUTOMOBILE		
Date	Employee	Hours	Date	Car No.	Mileage
				TOTAL	
				OTHER EXPENSE	
	TOTAL			TOTAL	

Name .....
Address .....
Order .....
Issued ..... 19.. Completed ..... 19..
Work Authorized by .....
Charge to .....
Approved by ..... Date ..... 19..
Billing Amount $.....

MATERIAL RECORD

Quantity	Complete Description	Cost	Quantity	Complete Description	Cost

QUICK RECORDING—This 5½ by 8½-in. job slip provides a complete record of service calls and small wiring. On the front are spaces for entering labor, job expense, customer identity and billing, while the back side has space for listing and costing 54 material items.

The U. C. Nolte Company loaned us the form as a practical suggestion to other contractors who have pondered about a simple system for small-job record keeping. Thank you very much Mr. Nolte.

HAZARD

OFFERS COMPLETE LINE for ADEQUATE WIRING

Adequate wiring must begin with an adequate service entrance cable.

HAZARD ABN and UBN SERVICE ENTRANCE CABLES

An adequate wire for all ordinary service jobs. Imprinted every 2 feet. Six standard colors. National Electric Code Standard.

HAZACODE FIREKROME BUILDING WIRE

A super-adequate wire for all important jobs. Super-aging and heat-resisting. Smaller sized copper carries your load.

HAZARD PERFORMITE WIRE

For adequate wiring in moist places. Replaces lead encased cable. Approved by Underwriters Laboratory per Section 3035 National Electric Code.

HAZARD WATERTITE WIRE

An adequate cable for interior wiring jobs. A new Hazard product, standard in construction and fully approved.

HAZARDEX NON-METALLIC SHEATHED CABLE

For adequate wiring on remodeling jobs use the cable with rip-cord for easy working and with flame-resisting, moisture-proof paper sheath between conductor and armor.

HAZARD ARMORED CABLE

An adequate cord for floor lamps, table lamps, radios, electric clocks, etc. A rubber sheathed, parallel lamp cord that is safe.

PERMEX LAMP CORD

For adequate protection on short runs or where many bends must be made, use

HAZARD FLEXIBLE STEEL CONDUIT

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.

WORKS: WILKES-BARRE, PENNSYLVANIA

New York Chicago Philadelphia Atlanta Pittsburgh Buffalo Boston Detroit Seattle Dallas Washington San Francisco St. Louis Los Angeles

Motor Shops

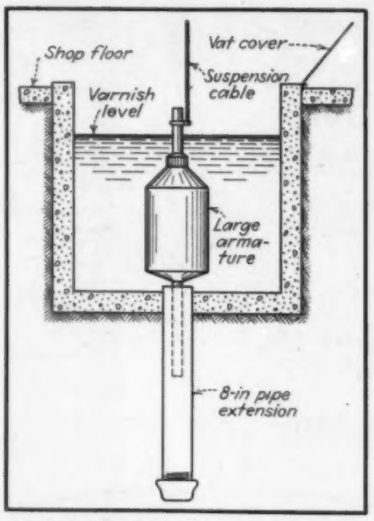
SMALL-JOB HEADQUARTERS

Every large shop has a certain amount of small motor repair work to do whether it is wanted or not. If it is handled by the same persons, who take care of customers for larger work, the small job can easily become a downright nuisance. So at the Roland Electrical Company shop in Baltimore, small repairs are handled in a separate department, up front. Customers who bring in a job never see the main shop, located toward the rear, and do not take up the time of the superintendent. This also saves time for the customer, who would often need to stand by while more important shop details are being discussed in the main shop office.

SHOP ANNEX—Small repair customers never see main shop but are waited on more promptly up front.

TANK FOR END-WISE DIPPING

An underground extension was made to a varnish vat at the Criterion Electric Company shop in Lodi, N. J. It permits large armatures and wound rotors with long shafts to be completely submerged for thorough impregnation.



LONG SHAFTS slide into pit extension allowing complete submersion of windings in vat.

This company built a concrete varnish vat flush with the shop floor, 4 ft. wide, 5 ft. long and 5 ft. deep. A 5-ft. length of 8-in. steel pipe was installed vertically at the bottom of the vat, which extends into the ground, and serves as a sleeve or hollow column to receive the rotor's shaft during impregnation. The lower end of this pipe is capped, while the upper end projects above the floor level of the pit to prevent solid matter from gradually settling into the hollow pipe.

WIRE PAYOUT RACK

Wire is kept readily accessible in the motor shop of the Porter Electric Company of Minneapolis. At one side of the winding section, a wood framework carries ten steel rods running the full width of the frame and laid into slanting notches.

The reels are slipped over the steel spindles and placed on the rack. This arrangement permits over 100 reels of commonly used sizes within immediate reach of the winder in less than eight

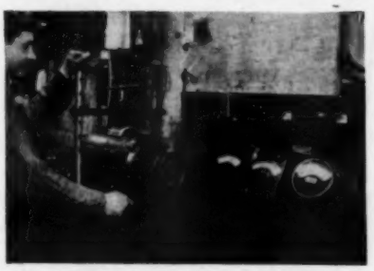
WIRE REELS that occupy little shop space. Located close to the winding machines, the spools need not be removed from the rack.

square feet of floor space. In ordinary use the wire may be unreeled directly from the rack without removing the coil.

SPEEDY MOTOR TESTS

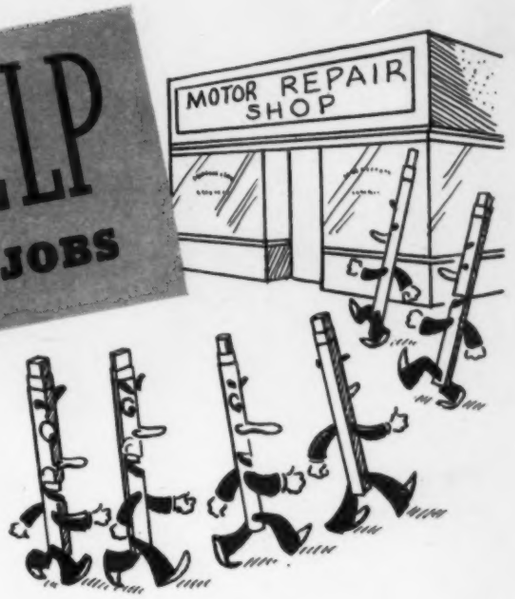
Quick testing facilities help mass production technique in reconditioning refrigerator motors at the S. J. O'Brien Sales Corp., of New York.

The testing station is equipped to take motors up to 10 hp. in size. Motors are set upon a cast base between pinned upright posts. A notched channel cross bar with screw clamp shoe is slipped over the motor. A few quick turns of the screw secures the motor without requiring the attachment of bolts. In testing the motor a rope sling, scale and grooved pulley provide the operator with means to apply overloads or stalled rotor tests. Instruments are provided reading 0/400 watts, 0/7½ kw., and 0/40 amps., according to the load involved. A motor driven contactor can be introduced for automatic intermittent starting and stopping of motors left to run-in. The operator starts and stops motors being brake-tested with a floor treadle switch.



BOLTLESS MOTOR STAND—Quick clamping of motors speeds final performance tests.

HERE'S REAL HELP
FOR YOUR MOTOR REPAIR JOBS



A Complete Line of Deltabeston Heat-resisting Magnet Wires

You'll find Deltabeston Magnet Wires a big help in your motor repair shop. Insulation is smooth, firm and uniform. Copper conductors are flexible. Installations can be made easily . . . speedily.

More important, *Deltabeston wound coils please your customers.* Motor users know that Deltabeston Insulation doesn't break down — even in the face of frequent overloads or high ambient temperatures. Service is more secure.

Deltabeston Magnet Wire with Purified Asbestos Insulation has proved its dependability, time-after-time. Insulation, *Felted* to the conductor, doesn't crack or break on sharp bends. Motor operation isn't interrupted by extreme heat. Oil and moisture don't cause costly failures.

Mail the coupon for samples and information on Asbestos-insulated Magnet Wire — or the new "Deltaglass" Magnet Wire with glass fiber insulation. A complete line of Deltabeston Asbestos-insulated Wires and Cables is distributed by General Electric Merchandise Distributors and Graybar Electric Company.

CAN YOU ANSWER THESE QUESTIONS ABOUT GLASS INSULATION?

Can glass-insulated conductors be used where moisture is present?
What's the most important factor in the construction of glass-insulated magnet wire?
Is glass insulation flexible?
Will glass fibers resist high temperatures?

THESE QUESTIONS — AND MANY MORE — ARE ANSWERED IN THE NEW BULLETIN ON "DELTAGLASS" MAGNET WIRE.

SEND FOR IT TODAY

EVERYTHING YOU WANT TO KNOW ABOUT HEAT-RESISTING MAGNET WIRE

Section Y-941,
Appliance and Merchandise Dept.,
General Electric Co., Bridgeport, Conn.

Please send samples and information about
- ☐ Asbestos-insulated Magnet Wire
- ☐ "Deltaglass" Magnet Wire

.....Name

.....Position

.....Address

GENERAL ELECTRIC

Estimating

TEN ESTIMATING FUNDAMENTALS

What are the basic principles that underly the estimator's art? This question was asked of experienced estimating engineers in several large and medium-sized cities. These men were connected with companies doing work of all classes and size. By putting their answers together, we have these fundamentals—

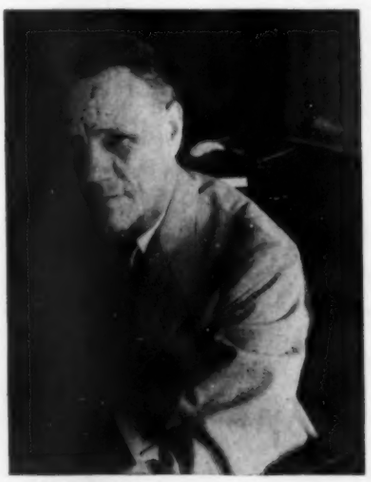
1. Don't expect to be a genius. The magic of accuracy is to visualize the job as it will go in, and not to bank on miracles happening before it is completed.
2. Select jobs carefully so as to limit the amount of fruitless estimating. It is poor advertising to burn midnight oil estimating jobs that can't be touched.
3. Use estimating forms that fit the job. If take-offs are properly made and entered, every estimate is an open book for later reference.
4. Know your costs. Labor units are tricky if applied to unfamiliar types of construction activity.
5. Watch trick clauses. Hasty estimating results in overlooking vague statements in specifications. The careless estimator is usually stuck with them.
6. Check the variables. Every job has special conditions such as unknown general contractor efficiency, crew requirements, weather conditions, job delay. All these affect the final cost.
7. Make cost comparisons. Tedious take-offs and extensions are often interrupted. Have a short-cut method of checking against the final estimated cost.
8. Keep alert for data. Swap costs with others and keep them ready for the next similar problem.
9. Study changing methods. The use of new tools, increased emphasis on welding, pre-fabricated construction, and specialized mechanics selected to do typical operations all affect labor costs.
10. Estimating requires a knack of analysis combined with painstaking concentration. It costs money to get excited or careless in the course of preparing an important estimate.

HOW TO SAVE TIME ON SMALL ITEMS

After a tedious take-off has been completed, few estimators are in a mood to prepare detailed listings of the small items needed to complete a job. For instance, the cutting and threading of conduit requires hacksaw blades and lard oil, machine threading requires temporary power, and the makeup of branch outlets and feeders requires tape, solder and wire nuts. How can such items be included quickly and adequately?

Several estimators have found it quite practical to make allowances on this basis—(1) For tape, solder and wire nuts—allow a percentage (some use 5 per cent) applied to the total cost of all wire and cable, (2) For hacksaw blades and lard oil—allow a percentage (some use 1 to 1½ per cent) applied to the total cost of all conduit.

Reasonably accurate percentages of this type can be ascertained for making such allowances, by checking up a number of completed job cost records. Once these values are determined, the estimator can save time at the windup of his take-off recapitulation without the risk of making an inadequate "guess" allowance. Furthermore, if such small items are entered on pricing sheets, they increase the bulk of an estimate and add just so much more clerical work in pricing and extensions to be checked before an estimate can be completed.



MIAMI MANAGER—*Union shops of the Greater Miami, Fla. area operate under the Electrical Contractors Association of Greater Miami, Inc., with Harold H. Fuselman as their full-time supervising engineer. Mr. Fuselman looks after the details of the association's voluntary Code agreements and bid depository, which applies to all bids of $150 or more. He is an experienced estimator and electrical designing engineer with a wide acquaintance among Florida architects and consultants.*

Estimating Forum

Ask almost any electrical contractor, and he will say that laying out an electrical system and estimating its cost is the most absorbing phase of his business. That's why estimating discussions get attention in any gathering of contractors. That's why letters about estimating routine come to us continually.

So we have set aside this space for discussing the estimator's problems. It is open to our readers as a forum for the exchange of ideas on estimating — industrial, commercial, residential and rural work—setting a switchboard, hanging fixtures—an interesting approach to labor costs—a bit of unusual experience. It will all be welcome. Also, when questions are asked, we will endeavor to find the answers.

THE BREAKDOWN OF A $10,000 COST

There are two schools of thought regarding the final estimate. One group totals the entire take-off, while the other group tackles each part of the job separately. Some estimators totalize all branches of a job into one running list of final pricing sheets which give the grand total quantities of each kind of material. The second and more popular method is to break down the estimate by divisions. When this is done, separate pricing sheets are prepared for each phase of the job.

An exceptionally good example of such a job-breakdown estimate is shown, as it was recently prepared by John Teufel of Hartford, Conn. Mr. Teufel is a licensed professional engineer who renders an estimating service to electrical contractors as a check against their own estimates. The service includes pricing and extensions of all labor, material and equipment items. The makes of important equipment items used in the estimate are noted as a guide to the contractor, in case he has other quotations to substitute.

As the summary sheet is arranged for the contractor, a spare column is provided, beside the estimated costs for the contractor, to use in posting his own estimated costs alongside for con-

400 Miles of Steel... to light your Cigarette

THAT book of matches in your pocket would fall apart except for that inconspicuous piece of stapling wire. *It takes approximately 444 miles of that wire every day to supply the enormous demand for book matches.*

Steel is even more important in almost every act of your daily life. Many food delicacies come to you in tin plated steel cans and are cooked on a steel range; the modern plumbing and heating of your house would be impossible except for steel; your clothes, glasses, watch, shoes.... all contain vital steel parts; you probably travel in a steel automobile or train to a steel framed office building or factory, to work at a steel desk or machine.

All the comforts and conveniences of modern life, which have come to be considered necessities, have been made possible by modern refinements in steels. Such refinements in steels do not just happen.... Youngstown maintains a great laboratory and an experienced organization, always working with customers to find the steel best suited to their needs and products.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

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YOUNGSTOWN

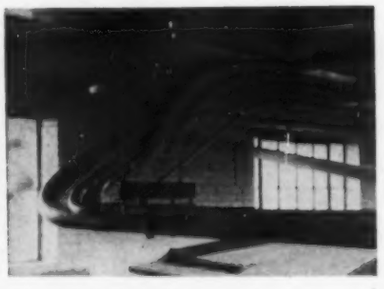
HERE'S WHAT THERE IS

IN IT FOR YOU-

WHEN YOU STANDARDIZE ON THE MANY-FEATURED

CLEVELAND CONDUIT HANGER!

● In a word, there's "PLENTY" in it for *you* . . . plenty of opportunity to increase your profit margin on every job; plenty of help in turning out better, neater, more satisfactory jobs because of the unique, patented features which completely revolutionize the art of hanging conduit. You have fewer units to handle . . . can pre-assemble conduit for better alignment . . . can hang parallel groups on one line and run them vertically and diagonally, as well as horizontally.



Seems hard to believe, doesn't it, without actually seeing it? Well, here are typical photos to help you visualize the improved wiring jobs you can offer with this revolutionary, new device!

Study these three views . . . see how much *neater* they look; how much more *rigidly* the conduit hangs; how much *easier* it must have been to make the installation with rails and clamps all set up, ready to receive the conduit with but one screw to tighten on each clamp. Accommodating various sizes of conduit on a single rail, and permitting suspension or fastening direct to beams, you've got the most flexible layout you could ask for.

Cleveland conduit hanging equipment gives you everything you need . . . channels, rails and clamps . . . and there are *no extras!* Sounds good? Let us send you all the details!

Write Today...

for full information on this innovation in conduit hanging . . . and its economical, efficient use in making your work more profitable!

THE CLEVELAND SWITCHBOARD CO.

2927 EAST 79th STREET CLEVELAND, OHIO

Estimating

[FROM PAGE 30]

venient comparison. Ruled spaces are provided on the summary sheet below "Total Cost" for adding overhead, profit and selling price calculations.

Suffield High School

Summary Sheet—with Addenda #2

Material Cost	3,192.04	.....
2,500 Hours Labor at 1.375 per hour	3,437.50	.....
Panels (T)	592.00	.....
Clock & Bell Equipment (Std.)	1,048.00	.....
Fire Alarm Equipment (Std.)	301.00	.....
Telephone Equipment (Int.)	258.00	.....
Foot & Border Lights (Wheeler)	465.00	.....
Lighting Fixtures 9 (G. E.)	1,150.00	.....
Lamps & Fuses	82.62	.....
Miscellaneous Costs	60.40	.....
Freight & Cartage	45.00	.....
Comp. & Pub. Lia. Insurance	84.94	.....
O.A.B.-F.U.I. & S. U. I. taxes	137.50	.....
Estimating Cost	22.00	.....
Total Cost	10,877.00	.....

The complete estimate for this job comprised eighteen pages in typewritten form, as follows—

Title page No. 1—Name of job, architects, closing date for bids, and names of general contractor bidders.
Page No. 2—Summary sheet (shown in part above).
Page No. 3—Alternate bid summary.
Pages No. 4 to 18—Detailed listings of material items and sub-totals of estimated labor for these divisions of the job—

a—Underground services to pole for light, power and telephones.
b—Inside work on services and meterboards.
c—Light and power panel feeders.
d—Power and heating circuits.
e—Public phone conduits.
f—Fire alarm wiring.
g—Grounding.
h—Laboratory panel circuits.
i—Clock bell, telephone and radio wiring.
j—Lighting branch circuits.
k—Alternate on telephone equipment.
l—Panelboard equipment.
m—Clock and bell equipment.
n—Fire alarm equipment.
o—Telephone equipment.
p—Foot and borderlights.
q—Lighting fixtures.
r—Lamps.
s—Fuses.
t—Covering addenda to specifications.

From the foregoing sub-headings of divisional pricing sheets, it is obvious that any part of the job can be analyzed quickly and with minimum confusion. Should changes occur in the job layout or in the design of any system, it is not necessary to break up the entire estimate or make a master recapitulation sheet to refigure one part of the job. The bid summary page, however, is often condensed for jobs of this size. For the Suffield High School, Mr. Teufel combined the cost of wiring materials for items "a" to "j", and listed a grand total for all labor. But the summary sheet indicates the separate costs of equipment and other items. Each item from "a" to "t", however, is supplied in typewritten pricing pages that give full details of material and the sub-totals of labor.

Maintenance

AND ONCE MORE WE EXPRESS OUR APPRECIATION!

LAST July in this column, we extended our thanks to a number of engineers and companies who had given us their help with this series of Maintenance Guide Sheets. These were men of special knowledge who had drawn from their experience and that of their companies, to aid in the selection and simplification of these background studies of the important electrical equipment used by the modern maintenance man.

Once more we wish to say our debt and express our thanks to another group who have contributed to the continuing articles, the discussion of control, distribution, lighting, heat and welding. Therefore, we acknowledge our appreciation to—

G. O. Wilms of Allen Bradley Co.
L. E. Markle and R. E. Marbury of Westinghouse Electric & Mfg. Co.
R. R. Cleghorn of Bull Dog Electric Products Co.
J. G. Jackson of Square D Company
John M. Turnbull of Springfield, Mass.
R. F. Beery of Benjamin Electric Mfg. Co.
Dean M. Warren and R. D. Van Nordstrand of General Electric Co.
M. M. Greer of Edwin L. Wiegand Co.
P. A. Meyer of Young Brothers Co.
A. F. Davis of The Lincoln Electric Co.

This series of articles began in January with a frank review of the electrical maintenance man's job. Then came—

1. Alternating Current Motors
2. Direct Current Motors
3. A.C. Motor Maintenance
4. D.C. Motor Maintenance
5. A.C. Motor Starters and Controllers
6. D. C. Motor Starters and Controllers
7. Maintenance of Control Equipment
8. Special Control Problems
9. Electric Distribution
10. Lighting
11. Electric Heat
12. Electric Welding (In this issue)

Coming articles will discuss—

13. Interplant Communication
14. Instruments
15. Power Tools and Appliances
16. Batteries and Rectifiers
17. Electroplating
18. Electronic Devices

ELECTRIC WELDING

Methods, Application and Care

ELECTRIC welding has such versatility, combined with its simplicity and economy, that it is a valuable tool for the maintenance man. Arc welding is particularly helpful. It enables the plant electrician or contractor to repair any type of equipment, fabricate replacement parts, build new equipment, and make alterations or additions to buildings. Also, it saves him time and money and does many jobs that he now feels are too difficult to be attempted.

Because there are several welding processes and each has its technique, however, those unfamiliar with the details are apt to hesitate to take on welding as another maintenance tool. But such it is and a review of welding methods and applications indicates not only its scope but the ease with which it is used.

Methods of Welding

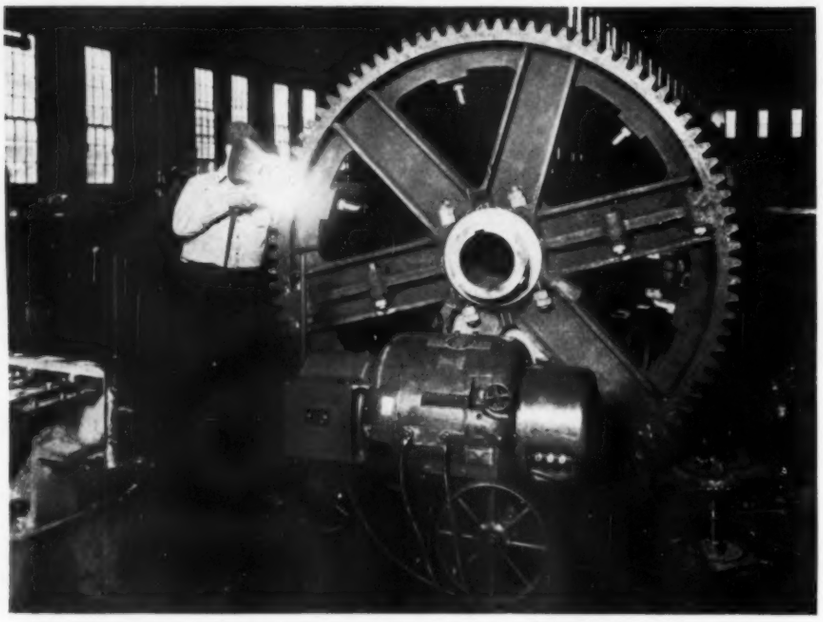
Resistance welding is a heat and squeeze process. The parts to be welded are raised to the temperature of fusion by the passage of a heavy electrical current through the junction. Pressure is applied mechanically to bring about the union. The field of resistance welding is divided into several processes—spot welding, butt welding, flash welding and seam welding.

Resistance welding has a limited application in general manufacturing because special equipment is usually required for each individual welding job. It is, therefore, practical chiefly for mass production and will not concern most maintenance men.

Atomic hydrogen welding employs an alternating current arc, maintained between two adjustable tungsten electrodes. At the same time, a stream of hydrogen gas is passed through the arc and around the electrodes. The heat of the arc breaks up the molecules of hydrogen into atoms which recombine outside of the arc to form molecular hydrogen. The very intense heat given off by the atomic hydrogen, as it reverts to the molecular form, is used to fuse the metals to be welded.

Atomic hydrogen provides an active reducing atmosphere which prevents oxidation of the weld metal, reduces surface oxidation on the parent metal and cools the tungsten electrodes. The

FABRICATING *equipment parts by fusing pieces of steel together with arc welding. (Lincoln Elec. Co. photo).*



DENTISTRY!—*A broken tooth on a large gear was repaired by welding. The gear was put back in service as part of a 300-hp. slope hoist at the Loomis Colliery of the Glen Alden Coal Co. A portable welder was used for the repair operation. (Westinghouse photo).*

electrodes are used only as a means for establishing and maintaining the arc and do not enter into the weld. They are slowly evaporated by the intense heat.

The electrode holder is manipulated and the flame is played over the edges to be joined, causing edges to fuse together. On thick stock, a filler rod can be fused into the weld.

Atomic hydrogen welding is somewhat more costly than usual arc welding methods. It is used for general welding of steel and ferrous alloys, for thin sheet materials, and for welding various non-ferrous metals and alloys.

Arc welding forms an electric arc between the work to be welded and an electrode, which is held in a suitable holder. The tremendous heat, in vicinity of 6500 deg. F., melts a small pool of metal in the work and heats the end of the electrode. The pieces of metal to be welded are brought to the proper temperature at the point of contact, by heat liberated at the arc terminals and in the arc stream. The metals are completely fused into each other, forming a single solid homogeneous mass, after it solidifies.

In *metallic arc welding*, the arc occurs between the work to be welded and the tip of a metallic wire. Tiny globules of metal from the wire are forced across the arc to the molten seat in the work. It is this fact which permits the use of metallic arc welding in overhead welding.

Carbon arc welding is a puddling process. The arc is formed between the work and a carbon rod held in the electrode holder. The small pool formed in the surface of the work is kept molten by playing the arc across it. Extra metal to form the weld is added by a filler rod. Greatest application of carbon arc welding is in automatic welding or in specialized applications. It is not applicable to vertical or overhead welding.

Metals and Joints

Many industrial plants now use the various methods of electric welding in practically every application where metal is joined to metal. For all metals used to any extent industrially can be arc welded. In general, these metals are—mild steel, high tensile steel, high manganese steel, light gauge steel, 18-8 and 25-12 stainless steel, 4-6 chrome steel, cast iron, aluminum, bronze, brass or copper. It is also possible with arc welding to provide hardfacing metal to enable equipment to resist any type of wear action in service including impact, batter, abrasion or corrosion.

Details of welding different metals and the applications of various electrodes to them are a study in themselves. So it is well to consult a manufacturer of welding equipment or of electrodes or an experienced welding operator for the procedure in any unusual or complicated situation.

There are five general classifications of welds—butt, edge, fillet, lap, and plug or rivet. The five general types of joints are—butt, corner, edge, lap, and tee. Subdivisions and combinations bring the total to 16 types of joints. For their use and illustrations refer to ELECTRICAL CONTRACTING, September 1937, page 49. The weld trouble shooting chart presented here will assist the maintenance man to make a good weld.

Welding Equipment

Large capacity a.c. welders usually have special electrical and mechanical parts. They are used for the various forms of resistance welding. Special control is often employed, as in spot welding, to limit the amount and duration of flow of current. Low current a.c. arc welders are available for sheet metal work and general repair shops.

Direct current is most commonly used for arc welding and the proper amount

PHYSICAL PROPERTIES OF WELD METALS AND MILD ROLLED STEEL

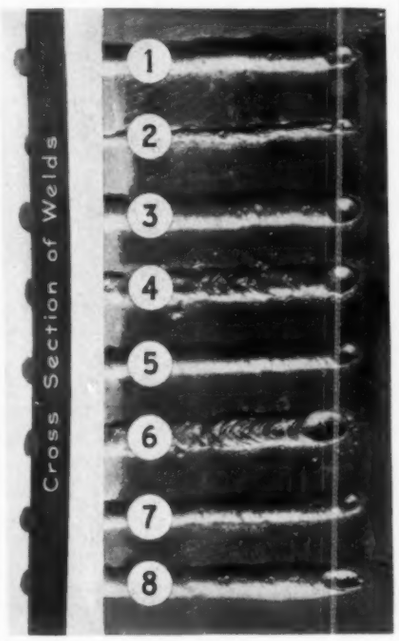
Material	Tensile Strength Lb. per Sq. In.	Ductility Per Cent Elongation in 2 In.	Density Grams per c.c.	Fatigue Resistance* Lb. per Sq. In.	Impact Resistance Ft. Lb.
Weld Metal, made with bare or washed electrodes	40,000–55,000	5–10	7.5–7.7	12,000–15,000	8–15 (Izod)
Weld Metal, made with shielded arc	65,000–75,000	20–30	7.84 7.86	28,000–32,000	50–80 (Izod)
Mild Rolled Steel	55,000–65,000	20–30	7.86	28,000	40–80 (Izod)

* Maximum stress in outside fibres, 10 million reversals without failure. Rotating beam test.

Note: Superiority of welds made in a shielded arc.

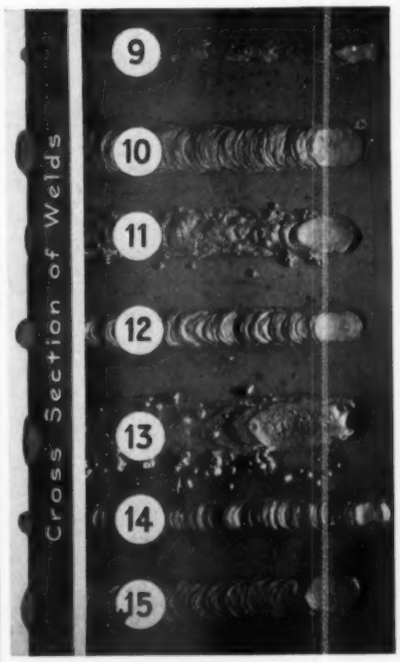
WELD TROUBLE SHOOTING CHART

ARC WELDING WITH BARE ELECTRODES



WELD CHARACTERISTICS				
Illustration Reference	Penetration and Fusion	Appearance or Bead	Cause of Trouble	Remedy
1	No crater — porosity	Irregular	Reversed polarity	Change polarity of current
2	Almost no crater — no fusion	Irregular in width — flat	High speed of travel	Reduce speed of travel
3	Crater excessively deep	Piles up and rolls over — bluish color	Low speed of travel	Increase speed of travel
4	Very little fusion — crater shallow	Flat	High voltage (across arc)	Decrease voltage (across arc)
5	Poor — crater shallow	High	Low voltage (across arc)	Increase voltage (across arc)
6	Poor weld characteristics porosity	Flat	High current	Reduce current
7	Poor — very shallow crater	Bead piles up — overlap	Low current	Increase current
8	How a weld properly made with bare electrode should look. Note penetration and fusion is good — Crater averages 1/16-in. deep for 1/8-in. rod. Appearance of bead is smooth with no overlaps.			

ARC WELDING WITH COATED ELECTRODES



WELD CHARACTERISTICS				
Illustration Reference	Penetration and Fusion	Appearance or Bead	Cause of Trouble	Remedy
9	Small, rather well-defined crater	Small bead — undercut	High speed	Reduce speed
10	Crater normal	Wide bead — overlap large and bead heated to considerable area	Low speed	Increase speed
11	Wide and rather deep crater	Wide — splattered	High volts	Reduce volts
12	Small crater	Sits upon plate but not so pronounced as for low amperes. Somewhat broader	Low volts	Increase volts
13	Deep long crater	Broad rather thin	High current	Reduce current
14	Not very deep nor defined	On top of plate	Low current	Increase current
15	How a weld properly made with coated electrode should look. Note penetration and fusion is fairly deep and well defined. Appearance of bead is excellent and there is no overlap.			

DATA FOR ARC WELDING PLAIN BUTT JOINT

In Various Thicknesses Of Plate in Flat Position. For Welds Made On One Side Only

Thickness Inches	Beads or Passes	Electrode Size Inches	Current Amp.	Minimum Arc Volts	Speed Inches per Min.	Actual Welding Speed Ft. per Hr.	Pounds of Electrode per Foot of Weld
3/16 plate	1	1/4	190	30	18	90	.078
1/4 plate	1	5/16	300	34	18	90	.133
3/8 plate	1	5/16	425	38	15	75	.226
1/2 plate	1	3/8	500	40	10	50	.46

and voltage is obtained by two methods. The first employs a source of constant voltage, and a resistance is connected in the welding circuit to reduce the voltage for welding.

A later method, and one most generally used today is a motor-generator of the variable voltage type. The motor operates on any commercial power circuit. The generator is built in 75, 100, 200, 300, 400, and 600 amp. sizes. The voltage adjusts itself to the varying voltages demanded by the arc. This type of welder has the added advantage of portability.

One manufacturer of the motor-generator type of arc welders provides a dual continuous control to vary the type and size of welding arc. A welding head is used for automatic welding such as a continuous welding of pipe and tubing. The head can be self-propelled and an automatic electrode feeder can be used where additional filler metal is required.

For all welding operations, operators require protective equipment such as face or head shield, apron and gauntlet gloves. Welding operations should be enclosed in a booth or by a portable screen painted dead black. In addition there should be a full assortment of electrodes.

Metallic electrodes or *welding rods* are made in various diameters and compositions for arc-welding practically all kinds of metals used in industrial plants. They may be classified in four groups: bare, washed, semi-coated, and heavily coated shielded-arc.

Carbon electrodes can be obtained in various diameters. They are used for manual welding and cutting, and automatic welding with the shielded arc. The polarity to employ is established by the electrode designer.

Cost of Arc Welding

Calculation of the cost per foot for arc welding, is based on known data—diameter of electrode, pounds of electrode deposited per foot, welding (arc) speed in feet per hour, labor cost in dollars per hour, power cost in cents per kilowatt-hour, welding amperes, arc voltage, electrode cost in cents per pound, operating factor (which is the ratio of the time the arc is in actual operation to the total time required to complete the operation—example lap joint, 40 to 60 per cent), and efficiency of welding machine during welding operation. The formulas are—

$$\text{Labor Cost} = \frac{\text{Labor per hour}}{\text{Welding speed} \times \text{Operating Factor}}$$

$$\text{Power Cost} = \frac{\text{Amp.} \times \text{Volts} \times \text{Cost kw.-hr.} \times \text{Oper. Fact.}}{1{,}000 \times \text{Welding Speed} \times \text{Oper. Fact.} \times \text{Eff.}}$$

$$\text{Electrode Cost} = \text{Cost per lb.} \times \text{Pounds per foot}$$

Total welding cost is the sum of the above (labor, power, and electrode) costs.

Maintenance of Welding Outfit

Like all other equipment this welding outfit requires care. There is the normal wear and tear and also the rough handling that portable tools all suffer. Here are a few suggestions for maintenance. The maintenance man will, in all probability, have more to do with the motor-generator type of arc welder. Maintenance of this type of equipment, of course, is somewhat similar to that of a.c. and d.c. motors and control. (See ELECTRICAL CONTRACTING, issues of April, May and August 1938.)

1. Feeders and extension leads for welding circuits should have adequate capacity and the voltage drop should not exceed three per cent.

2. All connections, whether on power or welding circuits, must be tight.

3. Sufficient outlets should be provided for power supply to the welders.

4. Power leads should be well insulated and a ground connection provided, preferably through the same cable.

5. Cables for the welding circuit must be flexible, and have ample capacity and good insulation.

6. Extra flexible cable should be used between the electrode holder and welder.

7. Cleanliness is very important. Dirt and flying particles should be kept out of the welder, control and bearings at all times.

8. Ball bearings are usually finished. They require lubrication at three to six months intervals, depending on the use. Space provided for grease in the bearing housings should never be over one half full. Inspect bearings once a year and hardened or deteriorated grease.

9. Replace brushes before they are worn out. Before being used on the machine, new brushes should be sanded into position with a piece of medium sandpaper, drawn back and forth under the brush and next to the collector ring or commutator. Be sure to blow out all carbon dust.

10. Collector rings and commutators should be cleaned occasionally with a clean rag, or while running with a piece of fine sandpaper.

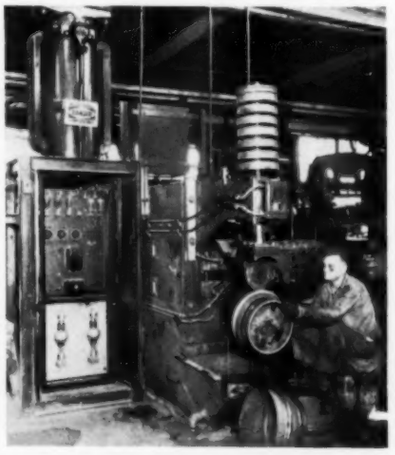
11. Check brush springs from time to time to make sure brushes ride evenly and firmly.

12. No work should be done on the rings, commutator and brushes unless the set is disconnected (except for cleaning as noted above).

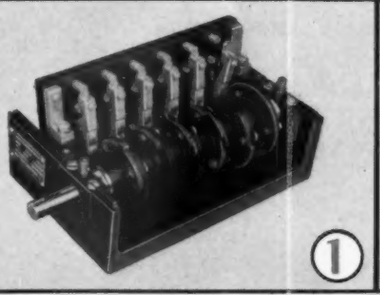
13. It is good practice to carry a complete set of bearings and brushes as spare parts for the machine itself.

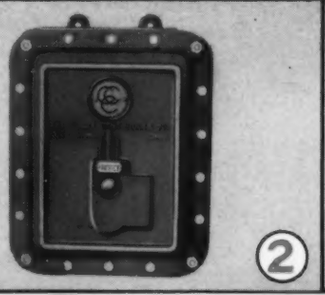
14. Control for the motor is usually supplied with the welder. It should be inspected and cleaned periodically. Contactor tips should be adjusted, smoothed or renewed, overload relays checked, and all connections tightened.

ELECTRONIC TUBES *are used to control the welding current on this a.c. welder. The equipment is installed in the production line at the National Enameling Stamping Co., Granite City, Ill. (General Electric Co. photo)*

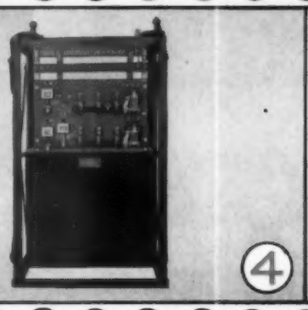


"3C" NEWS REEL OF OUTSTANDING 1938 ELECTRICAL CONTROL DEVELOPMENTS

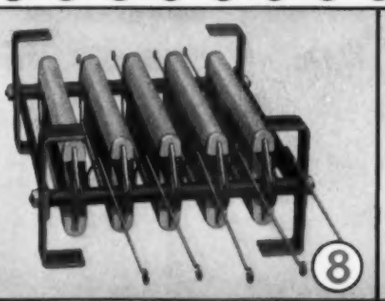




1. Bulletin 102 Type CL Cam Limit Switch
2. Bulletin 6013 Across-the-Line Explosion Proof Starter
3. Bulletin 7777 Clark Kickless Cable (Rees Patent)
4. Bulletin 5840 Primary Resistor Starter, Oil Immersed



5. Bulletin 6155 Wound Rotor Speed Regulator
6. Bulletin 6020 Across-the-Line Explosion Proof Starter
7. Bulletin 102 Type HL Hatchway Limit Switch
8. Bulletin 113 Ventwound Resistor • 9. Bulletin 101 Type FR Foot Switch



THE CLARK CONTROLLER CO.

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▶▶▶ In Willard Hall at Northwestern University, Ernest Freeman & Co. installed 50,000 feet of ½ to 2-inch electrical metallic tubing in concrete. Architects: James Gamble Rogers, New York, and Neiler Rich & Co., Chicago. General Contractor: R. C. Wiebolt.

NOT ONCE, BUT *time after tim*

STEELTUBES IN CO

● The best way to prove to yourself that ELECTRUNITE Steeltubes is the ideal raceway for concrete work is to use it on a concrete job.

That's what Ernest Freeman & Co., Chicago electrical contractors did — and they've been using this electrical meta tubing ever since for concrete wo Several of their recent installations shown on these pages.

Try ELECTRUNITE Steeltubes on y next job, whether exposed or buried. L

REG. U. S. PAT. OFF. SUBSIDIARY OF REPUBLIC STEEL CORPORATION

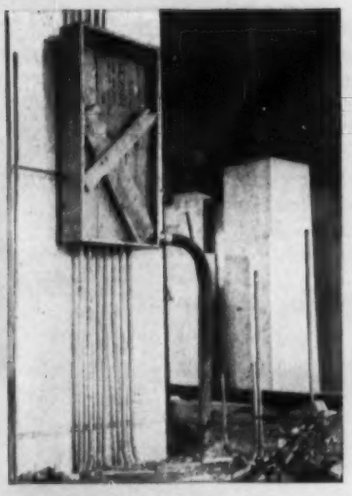
Steel and Tubes, *Inc.*

CLEVELAND . . . . OHIO

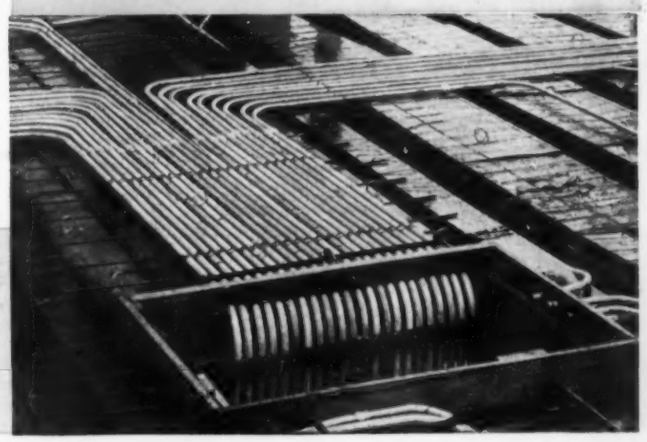
▶▶▶ Wiring in this Brink's Express building is protected by the sturdy steel walls of ELECTRUNITE Steeltubes, buried in concrete. Engineer: J. L. McConnell. General Contractor: Avery Brundage Company. Electrical Contractor: Ernest Freeman & Co.

THEY'VE USED CRETE!

what its ease in handling, fabricating, installing and wiring—its high strength and ductility—mean to you. Like other contractors who use this modern threadless conduit, you'll profit from its many advantages—and you'll use it time after time.



▶▶▶ Another Ernest Freeman & Co. job in which they installed ELECTRUNITE Steeltubes in concrete—The Valentine Boys Club, Chicago.



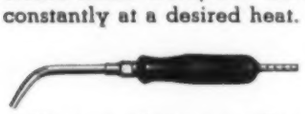
▶▶▶ Note the neat uniform bends made with ELECTRUNITE Steeltubes. You can save the cost of many factory elbows and couplings with this modern raceway.

Look for this red label. It is found only on genuine ELECTRUNITE *Steeltubes.*

FOR PROFITS IN
WIRING
CONTRACTS

PREST-O-LITE
TORCHES and SOLDERING IRONS

These torches and soldering irons supply proper heat for neat, rapid, economical installation of wire and cable. The torches, for open-flame work, produce instantly a concentrated, exactly controlled flame of high temperature. The soldering irons, for enclosed-flame work, can be kept constantly at a desired heat.



These appliances use Prest-O-Lite Gas—which is convenient, economical, and obtainable at thousands of Prest-O-Lite Gas Exchange Service Stations.

Your jobber will demonstrate Prest-O-Lite Torches and Soldering Irons. Call him—or write the Linde office near you.

The word "Prest-O-Lite" used herein is a registered trade-mark.

THE LINDE AIR PRODUCTS COMPANY
Unit of
Union Carbide and Carbon Corporation
New York and UCC Principal Cities
In Canada
Dominion Oxygen Co. Limited, Toronto

Insure Protection With Thermal Relays

Many small motors are protected by means of thermal relays. The principle upon which they are based is that it takes a certain period of time for a given mass to heat up. Under normal load, the heat is dissipated at the same rate that it is generated by the current flowing, and the relay remains closed. Under a momentary rush of current, the amount of heat generated is not enough to cause the relay to operate. Continued overload, however, causes the thermal element to operate the relay.

Some relays depend upon the melting of a special alloy by a heater coil. Others have a heater coil, which causes a bi-metallic strip to bend and break the contact. The details of the various types are familiar to most electricians.

A loose contact, either at the end of the heating coil or near the terminal post, can cause enough extra heat to be generated so that the motor will trip out without any overload, or perhaps at normal load. Such a condition in a starter is sometimes hard to locate, as the heater coil is naturally warm after a trip-out. Therefore, it is a good plan to go over all connections to see that they are tight. If any signs of corrosion are present, a little sandpaper used on the contacts will insure good connections.

In one case, a motor tripped out occasionally and nothing was thought of it, as it was assumed that there might be an overload at times. However, the condition became worse after a while. The trouble was finally located by watching the operation of the starter. It was noticed that one of the heater coils got to a red heat when starting.

Cleaning the heater coil and the contacts cured the trouble. A periodic and thorough inspection at regular intervals would have prevented the trouble in the first place.

For continuous and trouble-free operation, all starters should be regularly inspected and cleaned. Vibration or corrosion can cause loose contacts. In one plant an extra starting box is kept in the shop. At stated times the boxes are changed and the one which has been in use is given a thorough overhauling and cleaning.

Just a Set Screw

—and there are any number in the plant. But—projecting set screws have

TWO-SPEED MOTORS FOR WIDE LOADING RANGE

When the air-compressor equipment at this Buffalo brewery was modernized, two-speed, constant-torque squirrel-cage induction motors, with V-belt drive, were installed. The motors, two 150-hp. and one 100-hp., operate at 750/375 r.p.m. from a 2,200-volt, 25-cycle circuit, and have interlocked remote control by pushbutton. The two-speed motors make a wide range of loading possible, depending on the combinations of speeds at which the compressors are run. This modernization made possible a 25 per cent increase in refrigeration tonnage.

HOW TO SECURE BEST RESULTS *from* FLUORESCENT "DAYLIGHT" LIGHTING

Read The Facts About Benjamin's New Dayliter

The new "Daylight" Fluorescent Mazda Lamps provide the closest approach to natural daylight at the highest efficiency ever produced from such a light source. You will secure the best lighting results from this lamp and have the assurance of satisfactory and continuous performance by recommending and specifying the Fluorescent Units made by *Benjamin* — nationally recognized as one of the leading manufacturers of Industrial and other lighting equipment.

FOR "DAYLIGHT" ILLUMINATION

The Benjamin DAYLITER — a new unit for three Fluorescent Mazda Lamps is specifically designed to reflect and direct the *necessary* high amount of light (100 foot candles or more from the 36 inch size) usually required for color matching and other color work. It has wide application in industrial operations, offices and other work places. In addition, it is the ideal supplementary lighting unit for many inspection operations as well as for many other work locations where high levels of localized illumination are desired.

"COLD LIGHT"!

In the new Benjamin DAYLITER you have, for the first time, a lighting unit with "Cold Light". Place your hand or you head close to one of these units and you wi experience no annoying heat radiatio For this reason, the DAYLITER ma be mounted close to the work and to th worker. Moreover, because of the low su face brightness and proper shielding of th lamp, there is no sensation of brightne or glare; only restful, comfortable "da light" which is easy on the eyes.

EXCLUSIVE FEATURES

The Benjamin DAYLITERS are designe to provide efficient "daylight" illuminatio at low cost. These units have the followin exclusive features:

1. INDIVIDUAL REFLECTORS *for each lam* scientifically designed to insure highest lig efficiency; to produce uniform light covera on the working surface.
2. A POLISHED ALUMINUM REFLECTIN SURFACE with durable Alzak finish for hig est efficiency in providing accurate control light.
3. A PORCELAIN ENAMELED HOUSING f auxiliaries, wires, etc.; for greater durability also to protect reflecting surfaces against dent

AVAILABLE NOW AT NEW LOW PRIC

THE NEW BENJAMIN DAYLITE

For 18" and 36" Lamps; Available With Without Transformers or Auxiliaries

WARRANTY OF PERFORMANCE AND CONSTRUCTION

Benjamin Lighting Units for the Mazda Fluorescent Lamp are certified to comply with the requirements of Underwriters' Laboratories as evidenced by Underwriters' Laboratories Inspection Label or UL Re-examination Service Markers, affixed to the unit. They are warranted by Benjamin to have a *light output efficiency of* 78% *or more* and to comply with all recognized safety requirements, illumination, electrical and mechanical standards.

Auxiliaries supplied with these units are of the type made in accordance with specifications of Mazda lamp manufacturers and carry the *Seal of Certification of Electrical Testing Laboratories.* Units supplied without auxiliaries are designed for use only with such certified auxiliaries.

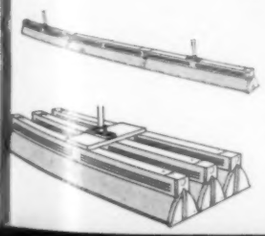
BENJAMIN TRADE MARK

LIGHTING EQUIPMENT

Distributed Exclusively Through Electrical Wholesalers

KEEP INFORMED — MAIL COUPON

Available Soon — **THIS AMAZING NEW DEVELOPMENT THE NEW BENJAMIN FLU-O-LINE UNIT**



Here again Benjamin engineers are pioneering the better and more efficient way. Fundamentally it consists of a highly efficient reflector with which is combined wiring channels and other accessories to provide easy coupling lengthwise or sideways in any combination. Write now for Benjamin New Device Sheet No. 561 for advance information on this amazing development.

BENJAMIN ELECTRIC MFG. CO., Des Plaines, Illinois.

Gentlemen: Please send, without cost or obligation, by return mail, compl information on Benjamin Fluorescent lighting units.

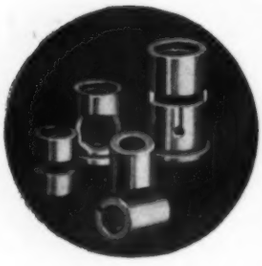
*Name*_____

*Title*_____

*Company*_____

*Address*_____

City _____ *State*



A Bunting catalog in your desk drawer is as good as a thousand bearings in your inventory. Write for your copy of the Bunting catalog which lists electric motor bearings available from stock for all makes of motors from 1/50 hp to 100 hp . . . The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

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STOP WASTED KILOWATTS AND WASTEFUL SHUTDOWNS

crippled many persons, and have been the cause of many fatal accidents. So when inspecting motors, couplings, pulleys and other equipment in motion, the maintenance man should be as cautious as any other employee.

Instances have been given by a building electrician of the Kansas City Power & Light Co., where a set screw head (1) caught in a trouser pocket, causing a fall and ripping trousers, (2) caught in cuff on leg of overalls, threw workman and broke his leg, and (3) scraped, cut and tore a man's fingers while he was inspecting an oil cup on a motor. Therefore all exposed set screws on revolving equipment should be replaced by safety set screws, or safeguarded effectively by some other method.

Ball Bearings Earmarked

Manufacturers of electric motors supply booklets or tags which give instructions on operation and maintenance. Based on such information and past experience, electrical maintenance men establish their schedules for servicing the motors. Many maintenance men periodically dismantle motor ball bearings to clean out old grease.

The Westinghouse Electric & Mfg. Co. now says that this practice is unnecessary for some of their grease lubricated ball bearing motors. To save the maintenance man a good many hours annually, a red tag is attached to motors which have an improved design of bearing. On the tag, a cross section of a bearing shows how fresh grease forces the old lubricant into an overflow sump. Excess or used grease in the sump can be easily removed through an opening equipped with a removable plug. The overflow sump also provides a pressure relief which prevents overgreasing when the instructions accom-

TAGS attached to motors contain valuable information for the maintenance man. In this case instructions are given that it is unnecessary to dismantle the ball bearings for cleaning.

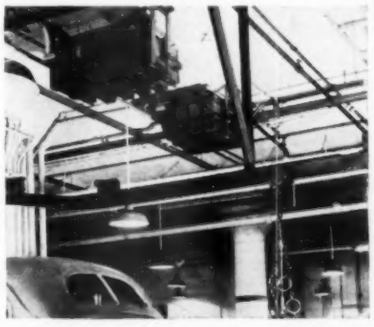
panying the motor are followed.

The tag is expected to earmark the following a.c. ball bearing motors with grease overflow sumps—fan-cooled, explosion-proof, open type built in frames 254 to 609 inclusive, and splash-proof type built in frames 254 to 800 inclusive.

Voltage Raised Power Bill Reduced

An average monthly saving of $1,200 in power costs was effected by the installation of a group of capacitors in one of the Detroit plants of the Murray Corp. of America. This saving is enough to pay the total cost of the equipment in less than a year.

Greater production necessitated increased electrical capacity to improve low-voltage conditions in the automobile body plant. Larger transformers and additional feeders could have been installed. But the Murray Corp. engineers studied the power situation, decided that the same results could be obtained with a capacitor installation, and in addition, make an attractive saving in power costs.



OVERHEAD—Capacitors, rated 80-kva. and 60 kva. 460 volts, 3-phase, 60 cycles, with fuseable switches, suspended from ceiling.

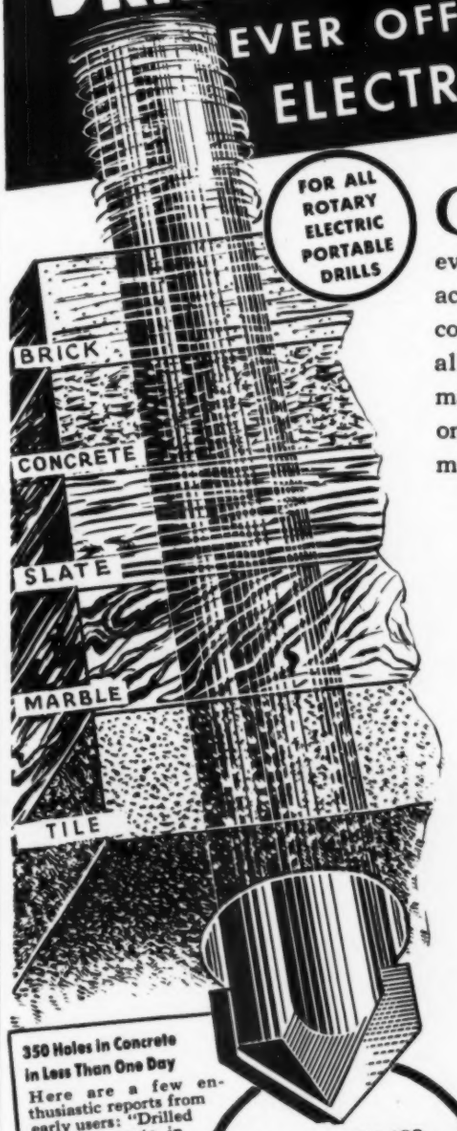
IN THE TRENCHES—One 10-kva. and two 15-kva. Pyranol capacitors with rack and fuseable switch mounted in service trench.

Announcing

CARBOLOY

MASONRY DRILLS

THE MOST AMAZING DRILL DEVELOPMENT EVER OFFERED TO THE ELECTRICAL TRADE



GET *your* share of profits from the most amazing drill development ever introduced for drilling straight, accurate holes in concrete, slate, brick, composition board, porcelain, tile and all other non-metallic construction materials. Reduces hole drilling time on all installation work to a matter of minutes and seconds instead of hours.

DRILLS 50% FASTER
LASTS 50 TIMES LONGER

The Carboloy drill is not just a new kind of steel. It's an entirely new metallurgical development manufactured by a special process. Carboloy contains no iron or steel. No special equipment is needed—operates in the ordinary type of rotary electric drill. It has made possible an entirely new order of speed, economy, accuracy and quietness on all drilling work. Lasts up to 50 times longer per sharpening. Drills 50% to 75% faster. Speeds up installation of expansion anchors and insures an accurate fit.

Get the facts about this new, outstanding profit-maker. Ask your dealer or send coupon.

CARBOLOY COMPANY, INC.
Detroit, Michigan

350 Holes in Concrete in Less Than One Day

Here are a few enthusiastic reports from early users: "Drilled 4" of concrete in 3 minutes!" — "Drilled holes and installed 350 anchors and pipe straps with 2 men in 7 hours."— "Cuts drilling time 95%" — "Best drill investment ever made."

SEND COUPON FOR **FREE LEAFLET** Dealers! Write for QUICK-PROFIT RESALE PROPOSITION

CARBOLOY COMPANY, INC.
2957 E. Jefferson, Detroit, Mich.
Send Free leaflet on Carboloy Masonry Drills.

Company.....
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City.....*State*.....

Pyranol-filled capacitors were located at 22 strategic points on various 440-volt power feeders. Inasmuch as no floor space was available, twelve 40-kva. equipments were mounted in existing service trenches beneath the main floor, and ten larger assemblies were suspended by ceiling hangers above the production area. Two other units, rated 120 kva., 4,600 volts, were mounted outdoors, near transformer banks.

Each of the capacitor units was assembled with disconnecting switches and put into service merely by making the three wire connections.

No More Summer Rejects

Waxide Paper Co. experienced difficulty in hot summer days in its manufacturing process when waxed paper would stick to the rolls. Also, every summer bakeries had to return many rolls of paper that were unusable on bread-wrapping machines because the wax had run and the paper would not unwind properly. These returns from customers who constitute a large market for the product had to be accepted on an adjustment basis, with expense involved in dewaxing and rewaxing.

The company installed an air conditioning system in its Kansas City and St. Louis plants, which eliminated these difficulties and saved several thousand dollars annually.

Both systems use York Ice Machinery Corp.'s compressors, and maintain an inside dry-bulb temperature of 75 deg. F., with not over 55 per cent relative humidity, when outside conditions are 95 deg. F. dry bulb and 67 deg. wet bulb.

In both plants the 10,000 cu.ft. per min. fan is arranged for two-speed operation, so the blower can be operated at low speed during the winter.

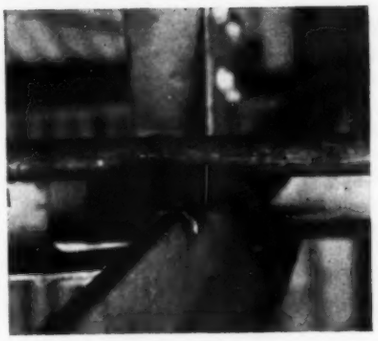
Lamp Life Prolonged

Watson Turner, is an electrical maintenance man for one of the major oil companies operating in Texas. He has found out how to reduce vibration in conduit runs mounted above roof trusses.

"It is always easier to string a circuit right than it is to come along after it's 'hot' and try to undo another fellow's mistakes," he says. "So I spend half my time (the overtime part) thinking of ways to cut costs and improve the lighting on jobs that never should have gone in incorrectly at the start.

"Every time conduit carrying the lighting circuit is installed, it is either laid atop the roof trusses or wired tightly to them. Result: a lamp replacement bill that keeps the boss hollerin', and the electrician humpin' making replacement of lamps—not burned out, but literally shaken to pieces. So as soon as a compressor plant is finished and the contractor is paid, out I go, and tackle the proposition of cushioning the light circuits. It is a job which ought to be done by the contractor, by rights—It would save the life of many light bulbs."

In one of the plants, conduit was laid on top of the roof trusses, because it was cheaper for the contractor to run it there than to suspend it below the steel. The illustration shows how one string of conduit was cushioned, resulting in an increase of over 400 per cent in light bulb life. Here is how it was done.



SUPPORT, *rubber-lined, for carrying conduit above roof truss members and providing shock insulation for suspended lamps.*

The conduit was cut loose from the steel, and supported in pairs of grips made from light channel and longitudinally split-pipe couplings. The channel and couplings were welded together to form halves. The channel sections were lined with thick rubber packing. The split coupling half straddles the roof truss, and the channel supports the conduit. All metal-to-metal contact was eliminated by the rubber packing.

The rubber strips have a life of several years. All the strips can be renewed for the price of one-twentieth of the savings in light bulbs not needed.

Electric Power Thaw Pipes

Many plants have found that the most practical way to thaw pipes is to do the job with electric power. In Detroit a line crew took one or two transformers and heavy wire to the job, set up the equipment and made all connections. Frozen portion of pipe was connected between terminals of the thawing wires. Current at 40 to 60 volts was passed through the pipe, heating it and melting the ice. Time for thawing was as little as five minutes.

A fixed charge was made for small pipes. For larger pipes the minimum charge per hour, determined by the estimator, was based on the size of pipe and the use. The electrical method eliminates serious delay and the cost of tearing out walls and partitions or digging through frozen ground to the pipe.

Most calls for thawing jobs come when a "cold spell" follows a thaw. Several theories have been advanced, a logical one being that the thaw causes snow and surface ice to melt, permitting water to seep further into the ground. The freezing which follows penetrates more deeply because the increased moisture in the ground impairs its value as a heat insulator.

CONTROLLED ATMOSPHERE *eliminates sticking of waxed paper.*

These patented contacts never have to be filed. That's only one reason why they last many times as long as copper contacts.

"Mama told you those contacts never need filing!"

Don't *you* make the mistake of cleaning or filing the contacts in Allen-Bradley solenoid starters. These double break, cadmium silver alloy contacts are always in perfect operating condition. Oxides which may form on them do not interfere with their satisfactory operation. Allen-Bradley solenoid starters are unusually easy to install, too. No other starter provides such extra large wiring space. All connections are accessible from the front. The white interiors reflect light and illuminate the starter in dark corners. There are lots of knockouts. Save time, money, and trouble by specifying Allen-Bradley solenoid starters on your next job.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

QUALITY

The Secret of Allen-Bradley Solenoid Starter Performance

Only ONE MOVING PART

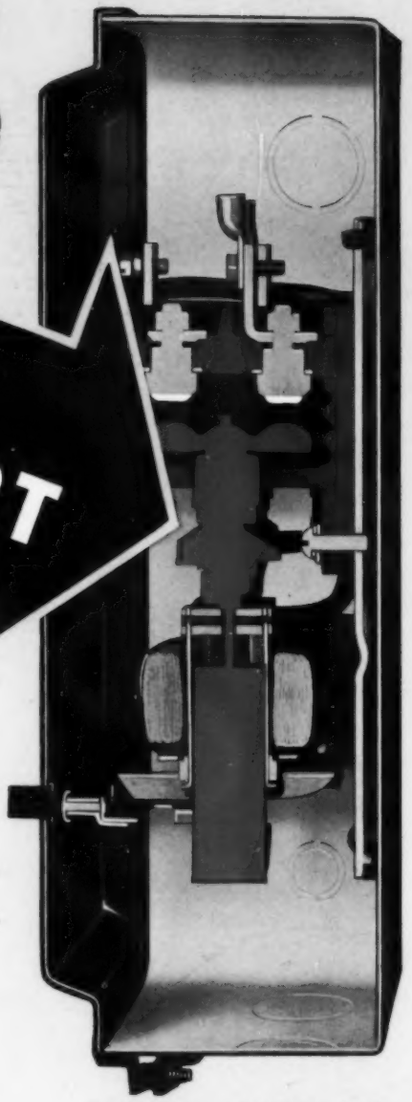
In the Allen-Bradley starter, the movable contacts are connected directly to the solenoid plunger—the starter's only moving part. The plunger slides freely in its phosphor bronze guide. Friction-producing parts have been eliminated. There are no complicated mechanisms or flexible jumpers. That's why these starters provide millions of trouble-free operations.

NO PIVOTS-PINS-BEARINGS in Allen-Bradley Solenoid Starters

Trouble due to dirty, corroded, or sticky pivots or pins, or delayed bearing action has been done away with. Designers of high speed machine tools can safely take advantage of this starter's precise and consistent operation.

Furthermore, you never need to clean or file the double break, cadmium silver alloy contacts on Allen-Bradley solenoid starters. Valuable contact life is not wasted. Maintenance expense is saved. And, these are not the only advantages of the Allen-Bradley solenoid starter! Write for booklet.

Allen-Bradley Co., 1307 S. First St., Milwaukee, Wis.



Cut-away view of the Allen-Bradley solenoid starter. Contacts and solenoid plunger form the only moving part.

This Basic Unit + This Movable Contactor + Two Relays and Arc Hood Cover = Allen-Bradley Solenoid Starter

Such Simple Construction Prevents Trouble

Bulletin 709 Solenoid Starter for across-the-line motors. Can be furnished in any one of seven different enclosures.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

D.C. Service Grounding

Q. *Why don't they allow 2 or 3 wire d.c. systems to be grounded at the service switch as for a.c. systems?"* —R. B.

A. Direct current systems are not subject to the same hazards of high voltage from transformer breakdowns or high tension crosses nor from line surges as are alternating current systems and, therefore, do not need the same degree of grounding. Also a.c. fault currents traveling from water piping to the ground do not cause as much damage as stray d.c. currents.

Lead Covered Wire in Conduit

Q. *"Is it necessary to install lead covered wires in ½ conduit for lights in a meat refrigerator? A fellow contractor said it was OK to use regular R.C. Wires."*—A. F.

A. Section 3035 in subparagraph d requires that in raceway systems (including rigid conduit) the conductors shall be lead covered "where the condensation and accumulation of moisture within the raceway is likely to occur" unless conductors "of other type specially approved for the conditions" are used. The use of the regular R.C. wire would not be permissible under this rule.

There is a new type of rubber covered wire, however, now being furnished by about nine wire manufacturers which may be used in moist locations where lead covered wire was formerly required. This type is sometimes referred to as "low absorption" rubber covered wire. This wire is listed by Underwriters' Laboratories as indicated by "Tags affixed to coils of wire having no lead covering and suitable for use in moist locations marked to indicate this."

It is hoped that a satisfactory method of marking this wire will be adopted so that its nature may be recognized after installation.

Location of Overcurrent Device

Q. *"Rule 4349 states that if the location of a tap to the feeder conductor is not accessible, the motor branch circuit overcurrent device may be placed where it will be accessible. According to this rule, it is not compulsory to locate the fuse where it will be accessible as it states "may". But according to 2435 (a) overcurrent devices must be located in a readily accessible location except for service equipment and busways. Which rule is correct?"*—F. R. B.

A. Section 2435a governs the location of overcurrent devices in premises with the exception of the two cases mentioned and must be followed. Section 4349 is really the same as 2434d (which is an exception to the first part of 2434) but applied to motor work.

***REA UTILIZATION** director George D. Munger discussing rural electrification problems and progress before the National Electrical Manufacturers Association, Policies Division in Chicago.*

Rules Not Retroactive

Q. *"Does rule 2110, in regard to receptacle outlets 20 ft. apart, apply only to new houses and old houses that have not been wired? How does this rule apply to an old single family house already wired that is going to be changed over to three apartments with a new service entrance with three meters?"*—J. P. R.

A. Revised rules in the Code do not become retroactive on installations already approved. If they did every job would have to be remodelled every time the Code was revised.

However, when a major change is made to an existing equipment, the Code rules in force at the time the alterations are made should be followed. Any old work or circuits left entirely undisturbed by the alterations do not have to be changed. Where a house is to be altered from a single family dwelling to a three family one, as stated in the inquiry, this would be considered as a major change and would require compliance with the new Code.

S.E. Cable for Interior Feeder

Q. *"I have a problem, it is in regard to a feeder from a master switch to a distribution panel in a church. This is a fire proof building excepting for the floor and furniture. Would it be permissible to use service cable (Type S.E.) with a bare neutral from a master switch to a distribution panel located about 100 feet from switch to panel? The wire is a three wire system and 120 volt to ground, the feeder is to run in a concrete tunnel 6'x4'.*—W. B. H.

A. The answer to the question is *No.* A bare neutral is permissible on this job only as far as the service entrance switch. All conductors of all interior wiring (except range circuits) must be fully insulated.

Reference to this is found in Code rule 3382, which specifies that "Approved service-entrance cable (Type SE and ASE) may be used in interior wiring systems *if all the conductors* of the cable are of the rubber covered type." The rule then goes on to give the conditions under which the uninsulated but covered neutral may be used on a range circuit or as a feeder from a master service to supply *other buildings.*

Better Lighting

LIGHTING THE MIRRORED SHOP

One of the bright spots of Newark's shopping area is Patsy's Dress Shop. Here a small sales floor was treated with recessed lighting units to create an atmosphere of spaciousness. A mirrored rear wall is used to produce an illusion which appears to double the store's depth.

A row of 300-watt ceiling units was installed on 3-ft. centers with the light focussed downward at an angle away from the mirrors. Customers may stand

SEEING DOUBLE—Small dress shop uses large sectional mirror with effective down-lighting to create a spacious atmosphere.

before this mirror at various distances, yet the angle of down-lighting provides them with effective illumination for trying on dresses. Readings made under these ceiling units showed 33.93 foot candles, and 31.93 foot candles between units, at 2 feet from the floor.

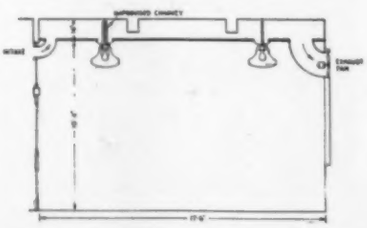
Other recessed ceiling units provide general store illumination, while a row of smaller down-lights illuminates the glass-tiled store wall. Window lighting readings ranged from 103 foot candles to 134 foot candles at 4 ft. from the floor and 2 ft. back from the glass. The island window readings ranged from 52 to 65 foot candles.

SELLING POWER—Main windows lighted to 134 f.c., and island window to 65 f.c., draw trade to this smart dress shop.

In wiring this small shop the N. H. Eglowstein Company of Newark provided 28 circuits in two circuit breaker type panels. The complete job amounted to $1600, which included $585 for lighting equipment.

LIGHTING AND AIR CONDITIONING

For interior lighting installations, where high levels of illumination are required, the effect of the high wattage on the room temperature must be considered. Each watt of electrical energy consumed in the lamps will generate 3.415 B.T.U's. of heat per hour and if this heat or any portion of it is set free

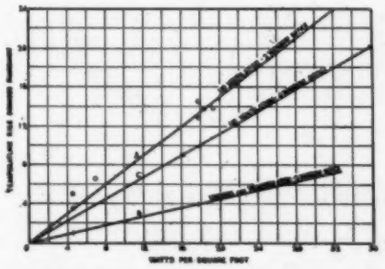


HEAT REMOVAL—Method of ventilation for heat removal with lighting at 10, 15 or more watts per sq. ft.

inside a non-ventilated room, it will naturally produce a rise in temperature. The actual rise will depend upon the B.T.U.'s generated and also upon the heat transfer properties of the walls, windows, floor and ceiling of the room.

To get some idea of the magnitude of the temperature rise in a typical office having an artificial lighting system utilizing different wattages up to 20 watts per square foot of floor space, tests were conducted at Nela Park. The accompanying curve shows the test findings. Because offices are generally ventilated during the summer months, the curve for the ventilated room is representative of the order of the temperature rise that can be expected. Where 4 to 5 watts per square foot are used, a temperature rise of about 1° F may be expected.

For lighting systems employing luminaires below the ceiling, it is mechanically possible to install a ventilating system with air ducts to the units so that about one-third the total generated heat can be removed. With the so-called *built-in* types of lighting equipment, where a free circulation of air is provided around the lamp, the amount of heat carried off will depend upon the glass through which the light enters

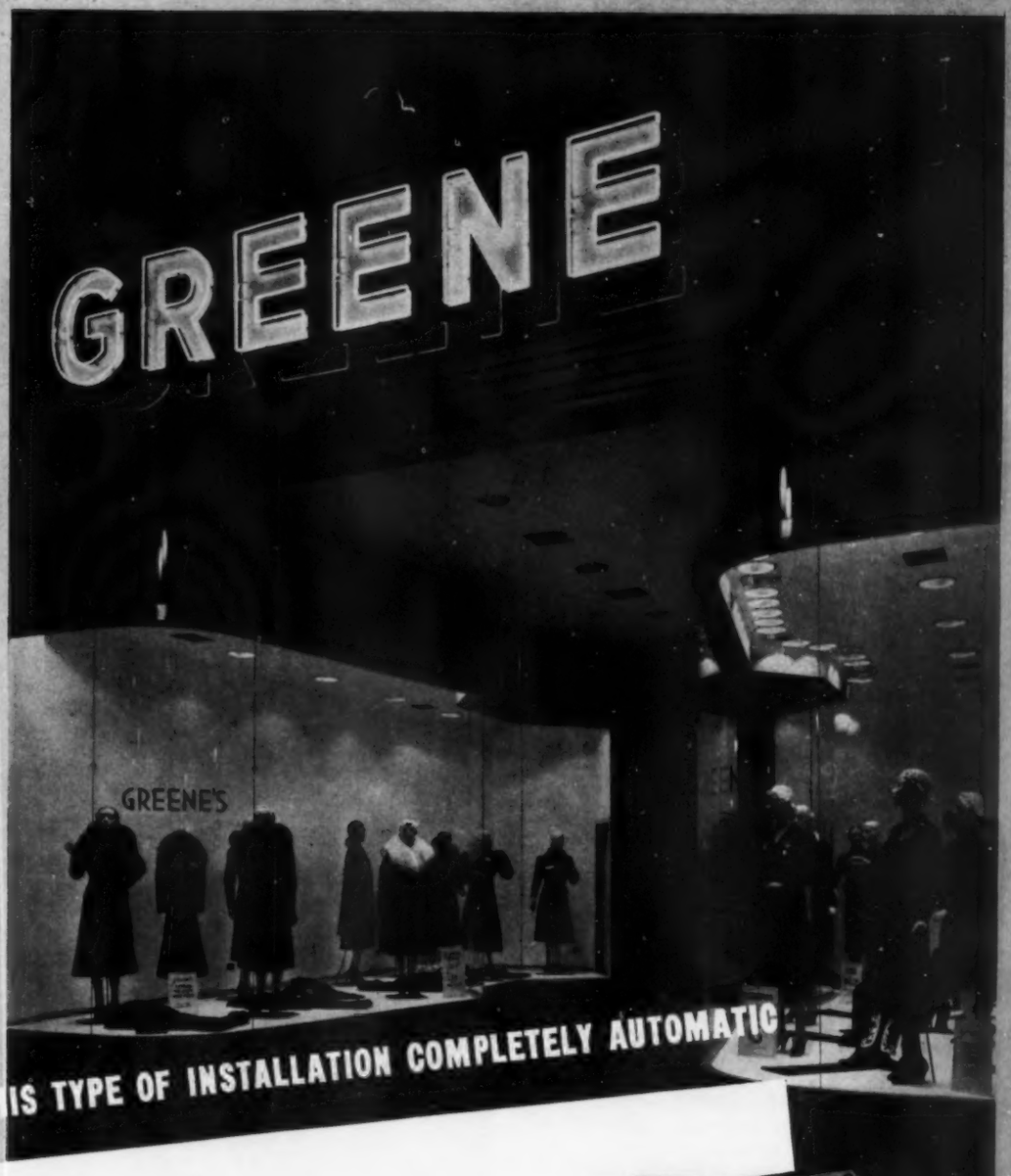


HEAT RISE—Effect of lighting up to 20 watts per sq. ft. with windows closed or open in two and four window offices.

the room. If this glass is of the heat-resisting, heat-absorbing type and is itself cooled, at least twice as much can be removed by the ventilating air as from usual types of suspended units. If none of the energy generated by the lighting system is carried off from 50 to 90 per cent of it will become part of the cooling load.

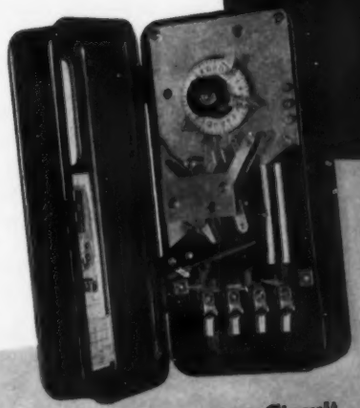
For interiors, where 10, 15 or more watts per square foot of electrical capacity are required, consideration should be given to such a separate ventilating system. It should not only carry off one-third of the heat energy, but make use of heat-resisting glass to intercept a considerable portion of the radiant energy. The problem of removing heat is important in northern latitudes only 3 to 4 months each year. During the other 8 to 9 months, this heat contributes to the heating system.

THE UNSEEN HAND



THAT MAKES THIS TYPE OF INSTALLATION COMPLETELY AUTOMATIC

On your next display window lighting installation when you come to the point of choosing a time-switch, consider that only a quality product can give definite promise that its first cost is the last cost. So, when you install the Unseen Hand, think in terms of <u>total</u> cost . . . of service calls you <u>won't</u> have to make . . . of the assurance that nothing will cloud the issue of customer-satisfaction in the <u>future.</u>



Sangamo Two-Circuit Time-Switch

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

In the News

PROGRESS IN CHICAGO WIRING CAMPAIGN

With 60 electrical contractors cooperating, the Chicago Electric Association plan for selling house wiring and fixtures on EFHA terms is rapidly gaining headway. More than half of the approved contractors have already ordered campaign material. The plan is being carried out under the direction of A. A. Gray of the Chicago Electric Association. Through the Electric Farm and Home Authority, rewiring and refixturing jobs with unpaid balances in excess of $40 may be financed on a down payment as little as 10 per cent of the job. The finance charge is 5 per cent per year, over a period as long as 24 months. The monthly payments are billed and collected on electric service bills by the Commonwealth Edison Company.

An extensive advertising campaign by the Electrical Association in the metropolitan daily news papers brings many inquiries to the association offices. Then a letter is sent to the prospect with a complete list of all certified contractors and some promotional material. By this method the prospect must select his own electrical contractor.

Promotional material including a letter series, mailing pieces, and newspaper mats are available to the contractors at cost from the Association. Contractors may also secure the help of trained men to help in closing sales. In cooperation with the plan several fixture manufacturers have made available special lines of lighting fixtures at attractive prices.

A/W PROMOTION COVERS BROADENED FIELD

The nationwide impetus to electrical home convenience is indicated in the way that utilities are promoting adequate wiring. A recent report from the National Adequate Wiring Bureau states that there were 114 utility companies promoting adequate wiring by mid-December. These companies are located in 44 states and have a total coverage of 12,135,000 residential meters.

Among the cities recently starting promotional organization are—Pittsburgh, Scranton and Reading, Pa.; Fresno, Calif.; and Roanoke, Va. Among the already organized A/W cities these further noteworthy activities are now set up or in the making:

Los Angeles will use fifty illuminated billboards in front of new adequately wired homes. The Electrical Development League of Southern California staged a "Wiring Rally" with 300 contractors present.

San Antonio, Texas is using twenty-four painted illuminated A/W billboards on main traffic arteries in residential areas.

Boise, Ida. reports a sharp rise in wiring standards, claiming an increase of 25 to 35 percent in provisions for control devices.

New Castle, Pa.—a campaign, scheduled for 1939 by the Pennsylvania Power Co. for New Castle, Sharon and Greensville, contemplates a special bonus for contractors for every property wired in accordance with the local specifications, and where certificates are issued. There will also be prizes for wiring contractors adding the most outlets during the year, and quarterly prizes for journeymen wiremen turning in the most plus business.

INTERSTATE EMPLOYMENT

NECA has appointed as a special committee, J. W. Collins, Chicago, Chairman, R. W. McChesney, Washington, A. L. Bush, New York City, to seek to obtain from the Social Security Tax Unit, Bureau of Internal Revenue, Washington, a workable plan for adjustment in the method of payment of contributions to state funds for unemployment compensation taxes. The purpose is to save employers from double contributions where men are transported across state lines for temporary employment but leave the original employer and take jobs in the adjoining state.

There are some 25 to 30 large cities located on state lines or so close that contractors frequently take jobs across the state lines and transport their men to such jobs, assuming that the men will return to their own state and that such work will be only incidental to their usual employment. In searching around for work, however, these men frequently stay in the adjoining state and receive a second job in that state. The Trial Boards of the Social Security Tax Unit have ruled that the state in which the workman remains then becomes the place of usual employment and that compensation for both jobs should be paid in that state. They have further ruled that if the contractor pays into the wrong state and then asks for refunds, the first payment was a voluntary payment and not subject to Federal credit.

Mr. Collins, has been faced with this problem through his position with the Joint Arbitration Board for the Electrical Construction Industry, Cook County, Ill. Chicago contractors are frequently taking men across the line into Indiana to handle jobs in closeby Indiana cities.

CHICAGO SHOPS FORM NISA CHAPTER

Motor dealers and motor repair specialists of the Chicago area are forming a Central Chapter of the National Industrial Service Association. Most of the 28 motor

CAROLINA CHRISTMAS—*Charlotte, N. C., merchants provided this fine 12-block lighting display during the Christmas season. Sponsored by the Chamber of Commerce, the merchants paid from 75¢ to $1.50 per foot of frontage. Hunter Electric Co. installed the 60 stars, 96 ornaments and 6000 lamps from a collapsible platform truck. This truck was also used for lamp renewals and other maintenance. A local sign company made the painted ornaments of celoglass, which were colorful and decorative by day also. Six 40-watt lamps illuminated them at night. To the motorist the effect was that of passing under a long glittering canopy of multi-colored jewels.*

IT MUST BE RIGHT

smooth sailing with TRIANGLE

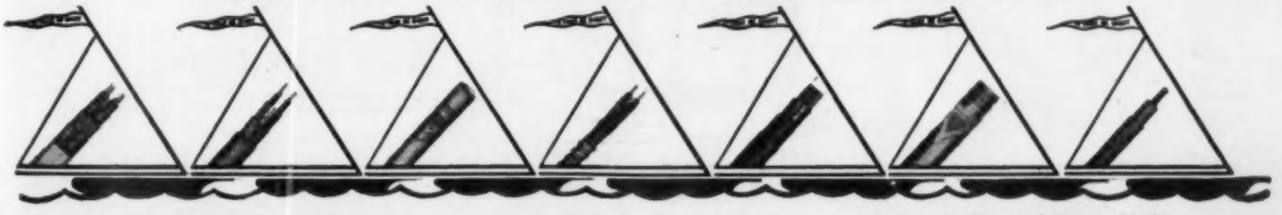
TRIANGLE PRODUCTS GO PLACES

TRIANGLE IS THERE!

— with a leading distributor next door to your job

Insist upon Triangle Products for Service, Savings and Satisfaction

TRIANGLE PRODUCTS REWARD BUYERS!



TRIANGLE CONDUIT & CABLE COMPANY, INC.

Horace Harding and Queens Blvds.
Elmhurst, New York City, N. Y.

In the News

[FROM PAGE 50]

shops who are cooperating to establish the chapter are already members of the national association. Roy Hyre of the Hyre Electric Company has been selected temporary chairman. E. P. James of the Northwestern Electric Company is temporary secretary and Walter Clark of Bowers & Clark temporary treasurer. Herbert Binner is executive secretary.

A constitution and by-laws committee comprising Walter Clark, Arthur Wagner, E. P. James and E. J. Ermel will present their recommendations on December 13 when permanent officers will be nominated. The organization will get under way formally at a meeting at the Sherman Hotel, Chicago, January 10, 1939.

JACKSONVILLE STARTS REWIRING PROGRAM

A central solicitation, planning and estimating service has been started in Jacksonville, Fla., for handling domestic wiring on a rotation basis among 29 electrical contractors of the local association. Set up to take advantage of EHFA 2-year plan financing on all jobs above $45, this program relieves individual contractors of two important items in selling rewiring to domestic customers. Both wiring promotion and solicitation are handled by two business promotion representatives of the city-owned power company.

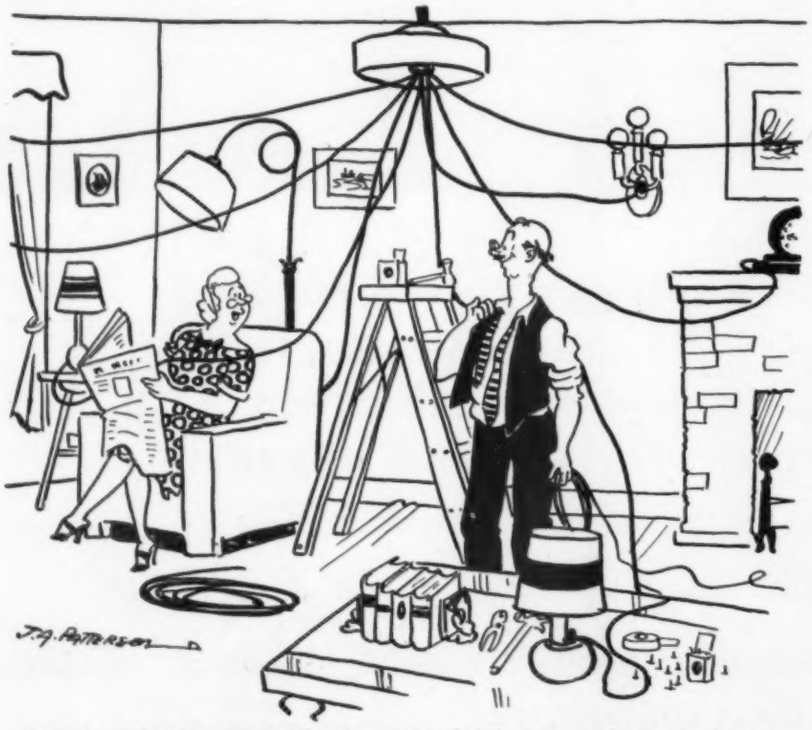
When a wiring prospect is developed, a wiring plan and specification is prepared together with a bill of materials and an estimate of the labor required to complete the job. Contractors are given these completely developed wiring leads in rotation, and need only price the estimate sheets to submit a quotation with the layout.

Blue prints and specifications are prepared in quadruplicate to provide copies for —owner, EHFA, inspector and the electrical contractor. With this procedure there is no confusion as to the customer's layout among the various parties involved in completing the transaction.

VIRGINIA CONTRACTORS ORGANIZE

At an enthusiastic meeting held in Charlottesville, Va., on December 9th the organization of the Virginia Electrical Contractors Association was completed. Constitution and by-laws were adopted, officers and directors elected and plans for its first year of operation developed in a constructive open forum session. T. W. Wilmer, President of Chewning & Wilmer, Inc., Richmond, was elected President of the Virginia Association, and T. C. Ritchie, President of Ritchie Electric Co., Charlottesville, was elected Secretary and Treasurer.

The Virginia Association has an enrolled membership of 81 and plans were made to double this membership in the coming year. The organization of the Virginia Association is the result of the work of J. H. Dyer, NECA Field Representative, during the past three months.



"It works, and it's ingenious, John Henry—I'll admit it since you insist. But I'm going to call the electrician just the same."

THEY CLICK—Miami Beach, Florida, chalked up 12 million dollars in construction work during 1937 and about 7 millions during the 1938 fiscal year. Two inspectors, Lincoln Brown, Jr. (left) and H. C. Inman handled all the electrical inspections and did considerable reinspection work to boot. That's clicking!

LOS ANGELES PROJECTS OPENED TO BIDS

After a twenty-five year policy of handling construction projects by "day labor," the Los Angeles Water and Power Commission recently issued instructions to get bids covering the erection of the proposed Boulder Dam-Los Angeles transmission line. The 260-mile 275,000-volt line is to cost about $12,500,000. Bids will be asked for erecting materials to be furnished by the Commission.

This change of policy had been recommended by the Southern California Chapter of the Associated General Contractors of America. The Chapter claims that about $10,000,000 worth of water works improvements will also be handled on a bid basis.

GRAYBAR'S 70 YEARS

Graybar Electric Company takes a bow this year—seventy years since Gray and Barton started making telegraph instruments and fire alarms. Its a long while in any man's time, so Graybar will have an anniversary celebration in its organization. The high point will be a nation wide banquet for its employees when they all sit down to dinner simultaneously in the 83 cities where Graybar branches are located.

FARM UNDERGROUND CONNECTIONS

At the recent meeting of their association, Minnesota Electrical Inspectors in Minneapolis made these two recommendations for underground wiring on farm jobs —1. Unless installed in approved conduit, ducts or other raceways, moisture resisting types of wires are not suitable for

ADEQUATE WIRING will help get these appliances OUT OF THE CLOSETS . . . and into use!

and . . .

If . . .

USERS let their appliances gather dust in closets because inadequate wiring prevents getting satisfactory service from them . . .

DEALERS can't readily sell more appliances, and . . .

CONTRACTORS get few calls to install new wiring since users don't make full use of present circuits, and . . .

CENTRAL STATIONS lose revenue and find resistance to building up the more profitable domestic load . . .

Then Everybody in the Industry Loses Profits

WHAT IS THE FUSTAT?

It is a fuse to which a thermal cutout is added.

It protects like a fuse against short circuits — even high resistance shorts such as occur in flexible cords.

It protects against permanent overloads, even when as light as 25%.

Yet it will not blow on motor starting currents of washing machines or other appliances.

Retails at 7½c

It has a base that guards against anyone robbing the circuit of protection.

It fits Edison base fuseholders through the use of an inexpensive adapter.

HERE'S HOW the FUSTAT HELPS GET *Adequate Wiring*

It shows need for new circuits

Permanent overloading is positively prevented. Once the correct size Fustat has been installed it cannot be replaced with a larger size and tampering it in any other way is virtually impossible. If additional circuits are needed the user cannot side-step the issue at the sacrifice of safety.

It reduces low voltage complaints

The user cannot load the circuit beyond the proper capacity of the copper. This prevents a voltage drop that is so frequently the cause of complaints about toasters, percolators and other appliances not operating efficiently.

It permits adding more appliances to present circuits

A circuit can be loaded to approved capacity without needless blows and without sacrifice of safety. The long time-lag of the Fustat keeps it from blowing on motor starting currents or other harmless overloads.

It builds user confidence in doing things electrically

When users can add new appliances without being annoyed by needless blows . . . when their appliances operate properly because low voltage cannot be caused by overloading . . . when users get real protection against dangerous cord shorts, such as only a proper size fuse can give . . . when users begin to think of the protective device as a desirable safeguard instead of a nuisance . . . then they will become more thoroughly convinced that the electrical way is the right way to do things . . .

—and right here is where the Fustat comes in to help get old appliances out of the closets onto the line — and to assist the whole industry build towards bigger and better times.

It's just good business to sell, install and use Fustats

The FUSTAT

For full information write to any of these firms

BUSSMANN MFG. CO., University at Jefferson, St. Louis, Mo.
JEFFERSON ELEC. CO., Bellwood, Ill.
KIRKMAN ENGINEERING CORP., 121 Sixth Ave., New York City
NATIONAL ELECTRIC PRODUCTS CORP., Fulton Bldg., Pittsburgh, Pa.
UNION INSULATING CO., 27 Park Place, New York City

Retails at 7½c in 15 to 30 amp. sizes

SHAWMUT
SHUR-LAG
RENEWABLE
FUSES
END FUSE TROUBLES
ASK

The CHASE-SHAWMUT COMPANY

NEWBURYPORT
MASSACHUSETTS

In the News

[FROM PAGE 52]

underground installations. 2. Where conduit or other ducts are not used, the proper type of cable for underground installation is underground service entrance cable. Where underground cable is used the following provisions are also recommended—

1. Junctions or splices should be made in approved weatherproof boxes above ground on poles or buildings or inside of buildings in approved accessible boxes.
2. Cables on outside of buildings or poles should be protected where subject to mechanical injury by conduit or tubes. Where cables run through foundation walls into basements, it is recommended that the cable be run through a piece of rigid conduit extending through the wall and two feet beyond the work. This will prevent cables from shearing off in case of frost, or settling of buildings.
3. Cables entering building may be run directly to main switch or distribution panels, the same as regular service entrance cables.
4. All service equipment on farms, wired with underground cables, should be grounded in the usual manner.
5. Underground cables should be laid at least 14 in. deep, surrounded by at least 2 in. of earth, sand or gravel. Cables should not be laid on a bed of rocks or covered with rocks without the 2 in. cushion of sand, earth or gravel.

COMING MEETINGS

National Electrical Manufacturers Association — Mid-Winter Conference, Waldorf-Astoria Hotel, New York, Feb. 5–10.

Florida Association of Electrical Contractors —Orlando, March 5–7.

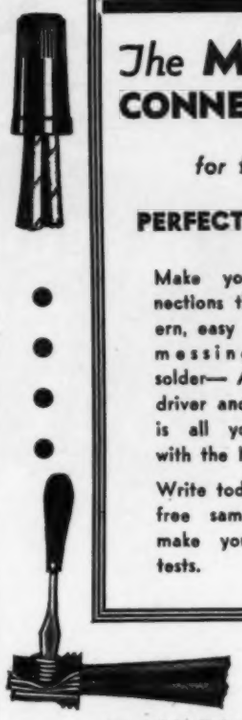
National Industrial Service Association—Convention, Jefferson Hotel, St. Louis, Mo., April 17–19.

SMALLCOMB TOPS LOS ANGELES

Clare T. Smallcomb, Smallcomb Electric Co., Los Angeles, was elected to succeed A. L. Stone as president of the Los Angeles Chapter, National Electrical Contractors Assn. at the annual meeting, Dec. 12, in Los Angeles. Prominent in the affairs of the chapter, Smallcomb was vice-president last year and a delegate to the convention of N.E.C.A. in Detroit.

SMOOTH SAILING IN CANADIAN NORTHWEST

Beneficial results are reported to have come from recent activities of the Victoria Electrical Association in the British Columbia capital city. An educational program was adopted near the start of a boom in private home construction in Victoria. In the earlier days of this building revival, the industry secured comparatively little profit due to competitive prices. Under the auspices of the Victoria Association, the local wiring firms were drawn into the organization and grouped as a separate body. An educational campaign was launched that has caused contractors specializing in smaller installations to main-



The MARR CONNECTOR
for the
PERFECT JOINT

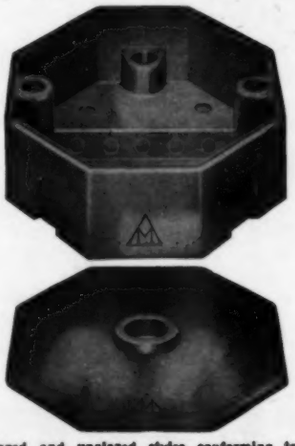
Make your connections the modern, easy way. No messing with solder— A screwdriver and a twist is all you need with the MARR.

Write today for a free sample and make your own tests.

Approved by Underwriters

THE RATTAN MANUFACTURING CO.
552 STATE STREET
NEW HAVEN, CONN., U. S. A.
GENERAL SALES AGENTS HATHEWAY AND CO.
220 CHURCH STREET, NEW YORK, N. Y., U. S. A.

Profit by USING
ILLINOIS
Dependable Porcelain
OUTLET BOXES



★Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILL.

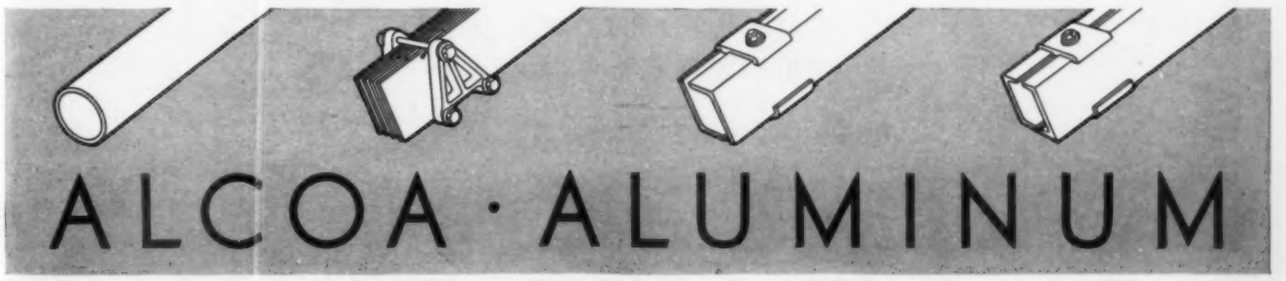
Tubular Alcoa Aluminum Bus Bar

SIMPLIFIES THE CONSTRUCTION OF OUTDOOR STATIONS

Light in weight, Aluminum bus bar places less burden on supports. They can be few and widely spaced, and the structure itself can be lighter in weight, thereby effecting many economies in materials and labor.

Standard construction methods and simple, inexpensive fittings are used with Alcoa Aluminum bus bar, whether tubular, flats, channels or angles. Installations are attractive. They stay that way, because Aluminum weathers well and stands up under corrosive conditions encountered in most manufacturing processes.

Alcoa Aluminum bus bar offers a high degree of thermal, electrical and mechanical efficiency. Ask our engineers to assist you in selecting the material which best meets your needs. ALUMINUM COMPANY OF AMERICA, 2197 Gulf Building, Pittsburgh, Pennsylvania.



GREENLEE
Inside-Wiring
TOOLS

Time and Money-Savers for the CONTRACTOR

Hydraulic Conduit Benders
Knockout Punches
Knockout Cutters
Cable Puller
Joist Borer
Electricians' Auger Bits
Bit Extensions
Hydraulic Pipe Pusher

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Our new catalog, No. 31E, illustrates and describes all the tools listed above, as well as others of interest. If you do not have a copy, send for one now.

GREENLEE TOOL CO.
ROCKFORD **ILLINOIS**

Greenlee Tool Co., Rockford, Illinois
Please send a copy of Catalog No. 31E.

Especially interested in .....
.....
Name .....
Street .....
City .....
State .....
My Jobber is ..... E.C. 1-39

In the News

[FROM PAGE 54]

tain prices which allow a reasonable profit margin.

Association membership comprises about forty firms, of whom sixteen are members of the wiring division, the other twenty-five embracing larger contractors and appliance dealers.

E. C. Horsey of the British Columbia Electric Railway Company, is honorary president of the association; A. Murphy, Murphy Electric Co., is president; A. Whiteman, of the Oak Bay Electric is vice-president and chairman of the wiring section; and A. R. Colby, Colby Electric, is secretary of the organization. The executive Committee members are: E. Cox, Ernie Emery, A. J. Langdon, and E. P. Saunders.

WPA DIGS FOR TRADE SLANG

The Federal Writers Project for the City of New York has recently collected what is termed a "Lexicon of Trade Jargon", covering the building trades. The WPA boys dug into electrical workers slang and came out with more than a hundred choice morsels. In it they have recorded and interpreted for posterity such choice bits as:—

Balogney—Cable.
Balogney-bender—One who installs cables.
Bible—Electrical code.
Bicycle—Chain drill used for boring holes in beams.
Boomer—Drifter—itinerant worker.
Bull-pen—Shop quarters for waiting unemployed workers.
Come-on—Worker using a "snake".
Gopher—Helper. (Derived from "go f'r this and go f'r that.")
Goulash—Cement.
Half-Power—An expression describing an electrician who comes on the job with a "hang-over."
Jewish neutral—An expression meaning the use of the armor of a cable as the third wire containing current.
Mudbox—Box, sometimes a terminal for wires, buried in "goulash".
Narrow-back—Building interior wireman.
Persuader—Hammer.
Roughneck—Lineman who finds and repairs defects in electrical work.
Scissor bill—See "boomer".
Tony bench—Bench where color is applied to electrical fixtures in a shop.

DEXTER AND HIBBEN JOIN A/W COMMITTEES

W. E. Sprackling, Chairman of the National Adequate Wiring Bureau, announces the appointment of Harris E. Dexter, Sales Manager of the Central Hudson Gas & Electric Corp., and chairman of the Sales Committee of the Edison Electric Institute, to the executive committee to replace Merrill E. Skinner.

SECONDS . . .
to
SURE CONNECTIONS!
with
ILSCO

SOLDERLESS CONNECTORS

For a real short cut to Better solderless connections, try ILSCO Solderless Connectors. You need no special tool, that you always misplace or lose. With a screw driver, wrench, or pliers, it's ***SECONDS*** to sure, permanent solderless connections!

Find out for yourself. Address Dept. EC for ***FREE*** samples.

ILSCO COPPER TUBE & PRODUCTS, INC.
5629 Madison Road, Cincinnati, Ohio

The Champion of all KITCHEN Exhaust Fans

3 speeds • Automatic Operation • Super-powered Motor

VICTOR In-Bilt VENTILATORS

More sales features, greater beauty, better construction, and easier installation—that's what you get in a Victor electric kitchen ventilator. Three models for your selection—for large homes, small homes and for low-cost or speculative type building. Send for new ventilation data book, which shows complete Victor line and gives detailed specifications, prices, and discounts, today!

VICTOR ELECTRIC PRODUCTS, INC.
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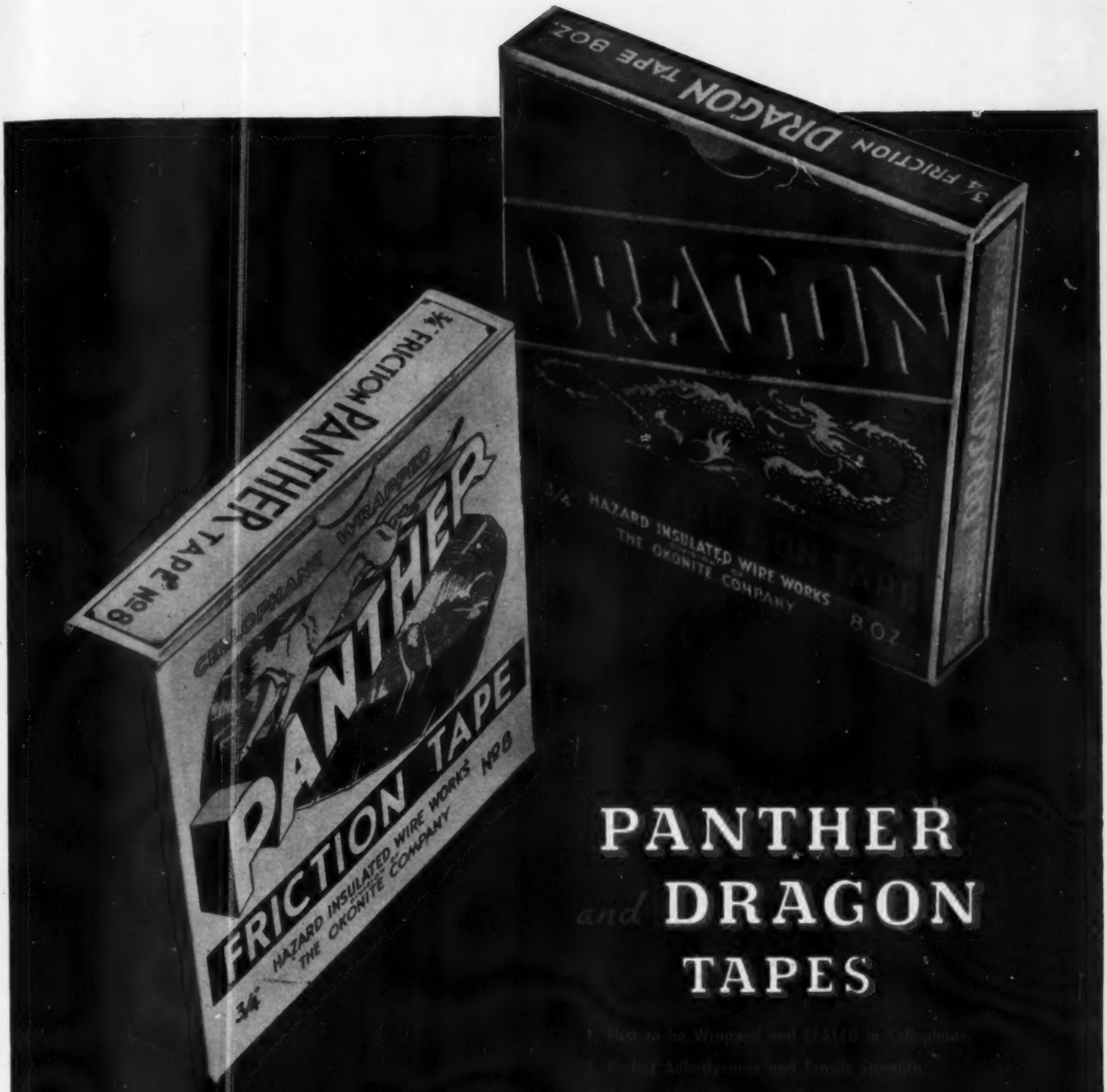
Free Data Book Write for Yours Now



PANTHER
and DRAGON
TAPES

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.

WORKS: WILKES-BARRE, PENNSYLVANIA

New York Chicago Philadelphia Atlanta Pittsburgh Buffalo Boston Detroit
Seattle Dallas Washington San Francisco St. Louis Los Angeles

P.S.- PORCELETS GET THE JOBS!

. . . THAT'S WHY THEY BELONG IN EVERY CONTRACTOR'S SALES KIT!

Unlike most postscripts, the "P.S." above is anything but an *afterthought* . . . it stands for the PERMANENCE and SAFETY which primarily make *Porcelets* (all-porcelain outlets) easier to sell, particularly where hazardous conditions exist.. They are forever shock-proof and short-proof, and fool-proof . . . yet, despite this superiority, you can offer customers substantial savings on the completed job which always helps get business. "P.P." *All-porcelain Systems* need never be grounded; require no clamps or connectors; and the same boxes can be used for various types of outlets. Let us send you illustrated data proving *Porcelets'* simplicity and breadth of their application . . . or, better still, ask your electrical jobber to show them to you!

PORCELAIN PRODUCTS INC.
FINDLAY OHIO

TIME SWITCHES

Automatic Synchronous Time Switches are equipped with self-starting motors. They are always in demand because of their accuracy and dependability. Simple design and construction make possible a high quality product at minimum cost. Capacities from 5 to 400 amperes. Priced from $4.95.

FLASHERS

These Automatic Induction-disc Motor-driven Flashers are indispensable because of low cost, durability, and dependability. We can supply Flashers for every effect from the simple ON and OFF to the most spectacular displays — one circuit — alternate — combinations — color change — spellers — chasers — relays. Priced as low as $8.50.

WRITE FOR MORE DETAILED INFORMATION.

AUTOMATIC ELECTRIC MFG. CO.
MANKATO - - - - MINNESOTA

MAKE *"foolproof"*
ELECTRICAL AND MECHANICAL SOLDERLESS WIRE CONNECTIONS —INDOOR AND OUTDOOR WITH

SHERMAN SOLDERLESS SERVICE CONNECTORS

Large machine threaded bodies and nuts — no sharp edges to damage wires or gloves — good thread fit, finger free but not sloppy — non-collapsing spacers—special high strength bronze alloy — hexagon heads of full and ample size—lowest in initial and final cost — large or small head.

LARGE HEAD TL TYPE

Made under exacting engineering supervision—send for trade bulletin No. 22.

H. B. SHERMAN MFG. CO.
BATTLE CREEK, MICH.

In the News

[FROM PAGE 56]

S. G. Hibben, Director of Applied Lighting, Westinghouse Lamp Division, has been appointed to the Plan Committee to replace J. F. O'Brien, resigned.

SOUTHERN CALIFORNIA CHAPTERS

As the result of the work of R. J. Gruendler, NECA Field Man, in Southern California NECA Chapters of electrical contractors have been established during the past six months in Los Angeles, Pasadena, Santa Barbara, Orange County, San Gabriel Valley, Harbor District, Old Baldy (Pomona), Riverside, Southeast, Ventura County. A total of 107 members are enrolled.

GEORGIA WANTS LICENSING

The Georgia Electrical Contractors Association is working to secure a state licensing law. A state law is also being promoted which will require the separation of the electrical, plumbing, heating, piping, ventilating and air conditioning work from the general contract on all state projects and the award of this mechanical work separate from the general contract.

IOWA MOVES FOR LICENSING

Meeting in the halls of Iowa State College in Ames, Iowa, 100 members and guests of the Iowa chapter, IAEI set the wheels in motion for proposing an electrical inspection and contractor licensing law to the coming legislature. The legislative committee appointed is headed by W. L. Fowler, Cedar Rapids electrical contractor and member of the electrical committee of N.F.P.A.

WORLD'S FAIRS TO TELL A/W STORY

Millions of visitors to the World's Fair in New York and the Golden Gate International Exposition in San Francisco will receive the story of adequate wiring in the home.

At the World's Fair, the homes comprising the Town of Tomorrow will be wired under the sponsorship of the National Adequate Wiring Bureau. There are 15 homes of various sizes, designs and prices in the group and it is anticipated that from 6,000,000 to 8,000,000 persons will visit this town. A plan for emphasizing wiring features to visitors includes the distribution of leaflets at each home. The funds for participation fees, also the supplying of materials for these wiring installations are being contributed by a

FREE— *sign and send* this Coupon

ARROW *New Weatherproof Socket . . .*

To ARROW ELECTRIC DIVISION, Hartford, Conn.

Send me *Free Sample* of your new Weatherproof Socket with die-cast zinc base, Number checked: ☐ 1306; ☐ 1308; ☐ 1300.

(*Name*)_____

(*Company*)_____

(*Address*)_____

(*City & State*)_____

11

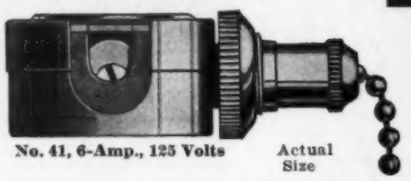
with die-cast zinc base—FREE SAMPLE

You'll want a sample of this solid die-cast job with sprayed aluminum finish. The zinc-base metal with aluminum coating stops corrosion, all weather. No. 1306—90° angle socket with shadeholder hood—can be had green-enameled to match (2¼") shade. Has ½" or ⅜" angle connection. No. 1300 has ½" hex cap and shadeholder hood; takes 2¼" shade and medium base lamps. Fiber gasket between hood and interior seals against weather. No. 1308, the same as No. 1300 but without shadeholder hood. *Any* one is yours — use the Coupon!

ARROW ELECTRIC DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

Listed by Underwriters' Laboratories

McGILL
Levolier
Switches



No. 41, 6-Amp., 125 Volts
Actual Size

Individual Control Saves on Light Bills

LEVOLIER Switch No. 1010 is designed purposely for heavy duty 10-amp. service. It controls 1,000-watt, high intensity lamps from the fixture, canopy or conduit box. Saves wiring expense. Comes in choice of three finishes, with seven feet of cord, with bell end or plain lever control.

LEVOLIER Switch No. 41 is the smallest 6-amp. switch made — only 5/8" thick. It is extremely popular due to wide adaptability . . . in homes, apartments, commercial structures, public buildings and institutions. Comes in choice of three finishes, with seven feet of cord, chain with bell at end, or plain lever control. Switches installed ten years ago show no noticeable wear in spite of continuous service. Order from your wholesaler.

No. 1010
10 Amp. "T" 125 Volts
Actual Size

McGILL MANUFACTURING CO.
Electrical Specialties of Quality
VALPARAISO, IND.
Box No. 670

A Complete Line Of
MOTOR CONTROLS

made by a recognized control manufacturer, priced in line with the industry and carrying the reputation of dependable operation. The Ward Leonard Motor Controls have everything that the contractor can wish for to make them desirable for him to sell.

A. C. Automatic Motor Starter

WARD LEONARD
ELECTRIC COMPANY
28 South Street, Mount Vernon, N. Y.

Electric Control Devices Since 1892

In the News

[FROM PAGE 58]

group of prominent electrical manufacturers and wholesalers.

The Pacific Gas & Electric Company's exhibit in the Palace of Electricity at the Golden Gate International Exposition at San Francisco will feature an electrical "robot" who will answer questions put to him by Fair visitors. The answers to listed questions will deal with the benefits of an adequately wired home.

MANUFACTURERS NEWS

Allen-Bradley Company of Milwaukee, has appointed the Industrial Machinery Company, Great Falls, Mont., to handle its line of motor control equipment in the Montana and Northern Idaho territories. West L. Powell is in charge.

Paul R. Urich, 1045 West 26th Street, Erie, Pa., has been appointed as its representative in the Erie territory.

W. H. Coleman Retires

William H. Coleman, long manager of General Electric construction material building sales, retired from active service on December 31. This wound up 48 years of service with "G.E." For 33 years he was in the supply department, then shifted to the merchandise department and since 1930 has been manager of building equipment in the windy city.

Allis-Chalmers Manufacturing Co. of Boston announces the resignation of George A. Burnham as assistant manager of the electrical department, in charge of Switchgear Sales and Engineering Division of the Condit Works. He will be succeeded by W. S. Edsall, sales manager.

Plishker Promoted

The Westinghouse Electric & Manufacturing Company has announced the appointment of Herbert E. Plishker as advertising and sales promotion manager of the Lamp Division. Mr. Plishker succeeds J. F. O'Brien, who recently resigned.

A member of the Westinghouse Lamp Division advertising force for more than eleven years, Mr. Plishker came to the company from the Pratt & Lindsay Advertising Company. He has served as assistant advertising and sales promotion manager for six years.

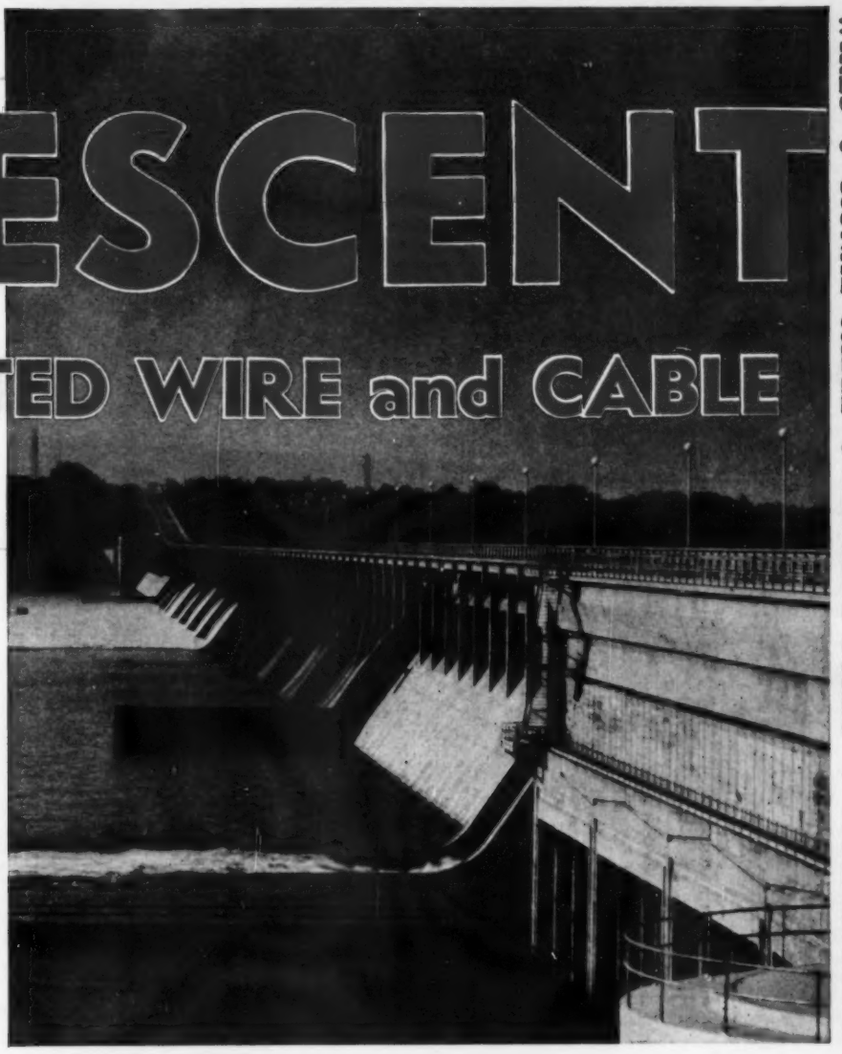
Adolph A. Henkel, who for the past twenty-five years has been associated with the lighting-fixture company of Henkel-Best, has recently consolidated the Henkel-Best Company and the Murray Construction Company, into a corporation known as Henkel, Inc. The main office is at 612 North Michigan Ave. in Chicago.

VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO WIRES • SIGNAL CABLE • FLEXIBLE CORDS • LEAD-ENCASED AND PARKWAY CABLES • ARMORED CABLE • CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

CRESCENT

INSULATED WIRE and CABLE

Utilities Use It!



The All Important Link between Power Source and Home and Factory

Today, we live electrically—and literally millions of feet of wire and cable, to provide power for industry and current for home lighting and appliances, bear the Crescent name. For wire and cable to meet every electrical need, look to Crescent and its corps of qualified Electrical Wholesale Distributors and Sales Representatives throughout the nation.

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INSULATED WIRE & CABLE CO. INC.
TRENTON, NEW JERSEY

Atlanta—Baltimore — Boston — Buffalo — Chicago — Cincinnati — Cleveland — Detroit—Harrisburg—Indianapolis—Kansas City—Los Angeles—Minneapolis—New Orleans—New York—Philadelphia—Pittsburgh—St. Louis—San Francisco

CRESCENT ENDURITE SUPER-AGING INSULATION • WEATHER PROOF WIRE

Every phase of electrical maintenance and repair work covered in this *new* Library

5 volumes of practical how-to-do-it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

Electrical Maintenance and Repair Library

5 volumes—2042 pages—1721 illustrations

IN these books will be found answers to practically all the repair and winding problems that the electrician will meet in actual practice.

The books discuss direct and alternating current windings—repair shop methods for rewinding armatures—commutator connection—the testing of armature windings—the testing of induction motors for faults—practical ways of reconnecting induction motors—commutator repairs—correct brush troubles, etc.

They tell you how to inspect and repair motor starters and generators—how to diagnose motor and generator troubles—how to figure new windings for old cores on induction motors.

You learn about three-wire systems, starting rheostats, transformers and starting polyphase motors, etc.

They give you scores of practical methods used by electrical repairmen to solve special problems.

New trouble-shooting and repair book now included in Library

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library of Electrical Maintenance and Repair includes Stafford's *Troubles of Electrical Equipment,* a new book full of helpful maintenance information special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc. This revised library helps you to know the why as well as the how of electrical maintenance and repair work, gives you the ability to handle bigger jobs with surety of results.

10 Days' Examination—Easy Monthly Payments

You can secure the use of these five great books on electrical repair work for *ten days' examination.* When you have seen for yourself what these books are and how much they can help you, send us your first remittance. The balance may be paid in monthly installments of $2.00 until the price of the library is paid. Send for the books today. Fill in and mail the Examination Coupon.

McGRAW-HILL BOOK COMPANY, INC.
330 West 42d Street, New York, N. Y.

Send me the Electrical Maintenance and Repair Library (5 vols.), postpaid, for 10 days' examination. Within 10 days of receipt I will send $1.00, and $2.00 monthly until $15.00 is paid, or return the books postpaid.

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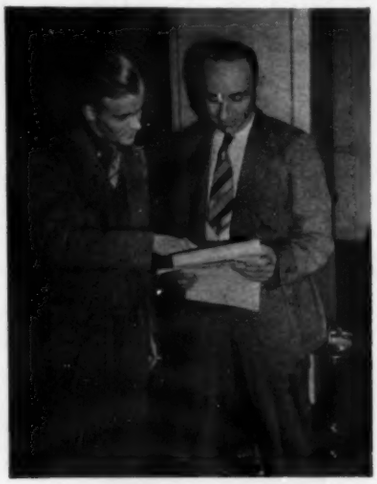
Address .....
City and State .....
Position .....
Company ..... E.C. 1-39

(Books sent on approval in U. S. and Canada only.)

Profitable Extras

Garry Mahigani of Hackensack, N. J., believes the electrical contractor can sell more than just the wiring job. Recently a large roadside dining room was wired, and the Garry Electric Co. got an order for four ventilating units. This concern is now having Garry wire another new place, which means more fans, floodlight standards, a special drive with neon effect and the commutator for a huge revolving windmill tower. And Garry makes it all pay.



DETROITERS—Don Galbraith, son of Detroit chief inspector examines registration list with Detroit Thomas Edison Club Secretary B. Hiller.

Consistent for Adequacy

In planning upward of 400 modernized lighting installations for offices and stores around Reading, Pa., F. E. Heins of the lighting service department of the Metropolitan Edison Co. has specified nothing less than No. 12 wire for branch circuits. Quite often No. 10's are specified. Not bad for the successful contractors, considering that a batting average of about 90 per cent has resulted from this type of local promotion.

Proof of Modernization

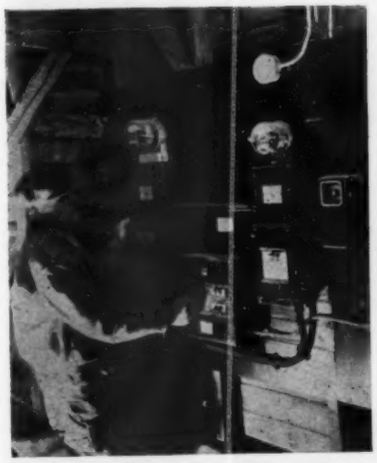
Several years ago the S. J. O'Brien Corp. yanked old steam engines, group drives and other Mid-Victorian furbelows, and installed a modern electrical system for a large New York City ink factory. Today Al Bonahur, vice-president for the O'Brien modernizers tells us maintenance costs for the ink makers are $1500 per month less than before the O'Brien cleanup. One maintenance electrician takes care of everything in the plant now.

A New Definition

Webster defines a much-used term in every contractor's vocabulary—the Cutthroat—as meaning murder, reported W. T. McAuley of the Kansas City NECA Chapter in his fine address before the recent Detroit Convention.

Instruction in License Exams.

Since the city of New York recently placed its examinations for master electricians' licenses under the Municipal Civil Service Commission, a trade school has set up a lecture course of instruction covering the city Electrical Code, as an aid to license seekers. In announcing this course, the school stressed the opinion that future applicants for a master's license would face a much more difficult test. Candidates must be citizens of the United States, over 21 years of age and have at least 3 years electrical experience.



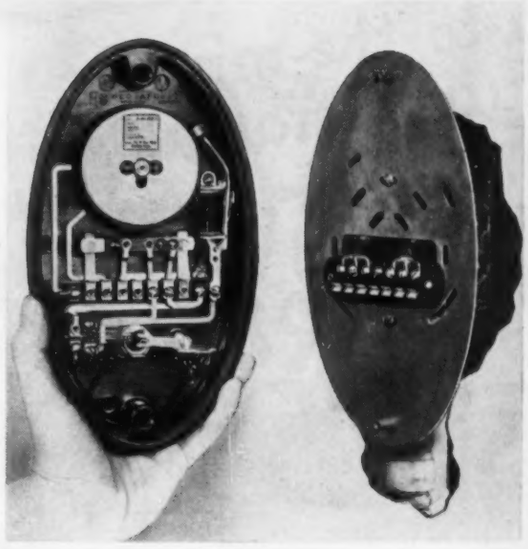
***POULTRY FARM ELECTRIFICATION**—Heart of the Westinghouse Poultry Proving Farm, near New Hope, Pa., where practical applications of electricity have doubled egg production and lowered costs. A connected load of 23 kw. compromises motors for pumps, grinders and fans, heaters for brooders and water warming, automatically controlled "egg-speedup" lighting, and sterilamps. Proving tests are being made at this farm which will be evaluated and reported to cooperating manufacturers.*

Test Charge

Toledo motor shops make a charge of 75¢ for testing motors brought in for repair estimates. The amount is later credited to the customer's bill when the motor is repaired. This simple device has eliminated expensive "shopping" by customers who once carried motors from shop to shop seeking bed rock repair prices, each stop requiring a complete motor test. The total cost of making these tests often equalled the cost of repairs.

The further evil of free testing for customers of second hand dealers and junk yards was also cut off. Such establishments frequently referred their customers to a legitimate motor shop to secure a test in a questionable motor.

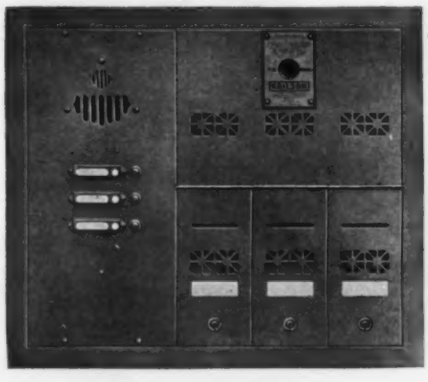
Quicker to Install... and no Headaches



CONNECTAPHONE *helps your PROFITS*

Save time—save trouble—make more money on interior telephone installations. The improved Connectaphone is quicker to install, easier to maintain. The bakelite body contains all the working parts, with bus bars used for all connections to eliminate wiring and soldering. After wiring, testing, plastering, and room decorating are finished, simply plug in and screw the body to the back plate. It's equally easy to change over to other circuits; just transpose one or two screws or bus bars. Parts are strongly made to withstand rough handling and are fully enclosed to prevent tampering and collecting dust. This improved telephone is furnished with 1, 2, or 3 buttons, as required.

Write or wire us for descriptive material.



3-Station Vestibule Phone

All mechanism, including distinctively toned bell, is assembled or molded in bakelite body. Receiver also acts as an extra signal.

Install Connectaphones with Connecticut Vestibule and Mail Boxes. Any number may be used, from 3 up.

Front View of Connectaphone

CONNECTICUT TELEPHONE & ELECTRIC CORPORATION

Established 1894

Division of Air Devices Corporation

MERIDEN . . . . . CONNECTICUT

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1939

To Help You ..... Plan ... Specify Requisition *and* BUY

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MINERALLAC HANGER

Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

MINERALLAC JIFFY CLIP

Sizes from .250" O.D. Tubing to 1 1/4" conduit.

See your Jobber

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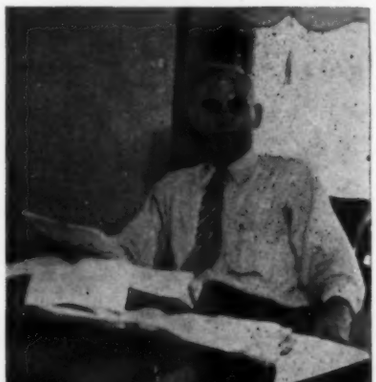
MINERALLAC ELECTRIC CO.
25 N. Peoria St., CHICAGO

More Gossip

Spring Party

A big event in Honesdale, Pa., each spring is Murray's Big Party. The Murray Company, which dates back to 1828, plays host to farmers and town folk from a wide area with entertainment, contests, demonstrations and displays. Quintin J. Murray of the third generation heads the company's electrical and home lighting departments that play an important part in modern farm life.



FLORIDA'S AMBASSADOR — *Few national contractor conventions have been held in the past decade without W. W. (Bob) Ingalls of Miami on hand as executive committeeman from Florida and neighboring states. The Ingalls Electric Co. handled many of the large wiring jobs during southern Florida's rapid building development. Bob reports good business and is optimistic about Miami's future growth.*

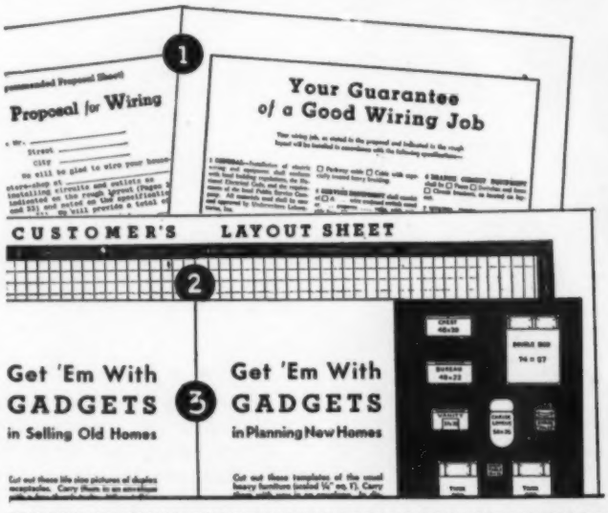
He Says It

Appearing before the recent Eastern Section meeting of IAEI, Charles Stark, an electrical contractor of Baltimore, put a new twist on this subject of obsolete wiring. His local contractor group is telling its public "Just as your clothes wear out, so too does electric wiring." Baltimore wants to start city-wide reinspection. A good start has been made by this plain talk to the public.

Butte Sports Lighting

By re-engineering the job, E. Hickey, manager of Western Plumbing & Electric Co., Butte, Mont., greatly improved the appearance and performance of the flood-lighting installation he just installed at the new high school football field in downtown Butte. Instead of an overhead distribution system he brought in underground feeds with remote control primary switching.

SALES HELPS FOR YOU *FROM MARCH ELECTRICAL CONTRACTING — AT COST OF PRINTING ! !*


1
Proposal for Wiring
Your Guarantee of a Good Wiring Job
CUSTOMER'S LAYOUT SHEET
2
Get 'Em With GADGETS in Selling Old Homes
3
Get 'Em With GADGETS in Planning New Homes

1 Proposal and Specifications Sheet, printed back to back on bond paper (shown on pgs. 30, 31, *March* Issue)—*$1.00 per 100 copies.*

2 A four-page folder, consisting of the Customer's Layout Sheet (shown in March Issue on pgs. 32, 33) printed in two colors on bond paper, with the Check List for Full Comfort Wiring (pgs. 36, 38) on back—*$4.00 per 100 copies.*

3 The two "Gadget" pages (34 and 35) printed on heavy yellow card stock, showing duplex receptacles and furniture templates.—*$3.00 per 100 copies.*

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Send me the following reprints, for which payment is enclosed:

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....copies No. 1 $1.00 per 100

....copies No. 2 $4.00 per 100

....copies No. 3 $3.00 per 100

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through this

NEW FREE SERVICE

Electrical Contracting brings you the latest literature of leading manufacturers without cost or obligation———

LIGHTING FIXTURES

1. A folder on fluorescent lighting fixtures for factories. Many illustrations and charts of footcandle intensities. The Miller Co.

MULTI-BREAKER

2. A catalog of 40 pages describing and illustrating multi-breakers, for circuit protection in homes, shops, commercial and industrial buildings. Square D Company.

LATHES

3. A book entitled "Modern Industrial Shops", featuring some of the modern industrial shops equipped with lathes. South Bend Lathe Works.

LIGHTING FIXTURES

4. Catalog No. 38 consisting of 88 pages of description, illustration and data on lighting fixtures. Price list is also included. Gruber Brothers.

CONDUIT HANGER

5. A folder describing and illustrating a new type of conduit hanger. Cleveland Switchboard Company.

SYNCHRONIZER

6. Bulletin 1193 illustrating and describing the synchro-operator for automatically paralleling a.c. generators, synchronous condensers, tie lines and frequency changers. Allis-Chalmers Manufacturing Co.

RANGE ELEMENTS

7. Leaflet 7238 and a folder illustrating and describing a new series of Chromalox super-speed range units with simmering heat feature. Edwin L. Wiegand Company.

POWER SPECIALTIES

8. A folder featuring variable speed transmission, soldering tools, wire strippers, insulation tester, voltage regulators, etcher and marker, resurfacers, precision grinders, coil winding and fuse specialties. Ideal Commutator Dresser Co.

WELDERS

9. An 8 page booklet B.2150-A entitled "The Welder's Trouble Shooter", listing common troubles met by welders, together with cause and cure for each. Westinghouse Electric & Manufacturing Co.

LAMINATED INSULATION

10. A 46 page catalog on Dilecto, a laminated phenolic insulation. Many photographs and tables included. Continental Diamond Fibre Co.

CUTTERS

11. Catalog No. 293 consisting of 32 pages of data on bolt, wire and chain cutters, nut splitters, light and heavy pruners and special two-hand tools for industry. Contains an index of tools and cross index of uses. H. K. Porter, Inc.

LIGHTING STYLE BOOK

12. A style book containing 120 pages of information and illustrations printed in two colors. It shows type of lighting for residential purposes; recommendations for exact lamps to be used to achieve highest efficiency from each fixture and a series of views taken in homes. Lightolier Company.

ELECTRICAL EQUIPMENT

13. Catalog sheets on reducing washers and locknuts, conduit closers, hanger iron, anchor bolts, telephone bracket clips, knockout seals, ground clamps, ground strip and one hole pipe straps. R. H. Green, Inc.

BEARINGS

14. Catalog No. 39, consisting of 52 pages of data on cast bronze, sleeve type bearings, electric motor bearings, precision bronze bars, graphited, cast bronze oil-less bearings and babbitt metals. Bunting Brass & Bronze Co.

TOOLS

15. Illustrated catalog and price list No. 37 containing 38 pages of information on Premium mechanics' tools. James Swan Co.

VALVES

16. Bulletins on solenoid operated valves for automatic and remote control of air, gas, steam and liquids. Automatic Switch Co.

TRANSFORMERS

17. Bulletin 381-Lt-2 describes the new line of Series 727 transformers, which may be surface or flush mounted. Suggested designs for installations are included as well as specification and dimension data. Jefferson Electric Co.

SWITCHBOARDS

18. Bulletin No. 385 describing the Vacu-Break compact type switchboards, featuring quick make and quick break switching with positive arc control. Bull Dog Electric Products Co.

LOCALIZED LIGHTING

19. A Handbook on Localized Lighting consisting of 24 pages of data. Specifications and footcandle intensity charts included, also many illustrations. Fostoria Pressed Steel Corp.

VIBRO-INSULATOR

20. An 8-page catalog covering standard line of Vibro-insulator rubber-to-metal type mountings. It discusses "The Principle of Vibro-Insulators," how to select, how to load and effective methods of mounting. B. F. Goodrich Co.

CONDENSERS

21. A catalog listing all standard items of Aerovox condenser line, with most popular types of carbon and wire-wound resistors as well. Aerovox Corp.

CIRCUIT WIRING

22. A booklet consisting of questions and answers on the new method of circuit wiring with plug-in strips. National Electric Products Corp.

LIGHTING FIXTURES

23. A folder illustrating and describing the "Midas" line of commercial plastic bowl lighting fixtures. Chase Brass & Copper Co.

AIR CONDITIONING

24. A booklet describing the Healthifier, which humidifies, circulates and washes the air. Illustrations included. Lion Manufacturing Corp.

TROL-E-DUCT

25. Catalog No. 386 describes the Trol-E-Duct wiring system for industrial plants and commercial buildings. Many photographs. Bull Dog Electric Products Co.

DRILL

26. A folder illustrating and describing the Holgun drill with the pistol grip and trigger switch. Black & Decker Mfg. Co.

SWITCHES

27. A folder featuring "Fuse Puller" switches for main, range, lighting and water heating circuits. Illustrations, descriptive and dimensional data given. Trumbull Electric Mfg. Co.

FARM WIRING PRODUCTS

28. A folder listing products for farm and home electrification, with five detailed tables on conductors. Anaconda Wire & Cable Co.

DIFFUSERS

29. Catalog Section 61-161 describing silvered bowl diffusers, designed for use with 300 or 500 watt silvered bowl lamps for general lighting of low bay areas in machine shops, assembly departments, metal working shops, printing shops and textile mills. Westinghouse Electric & Manufacturing Co.

ELECTRIC HOIST

30. Catalog W 38 describing and illustrating Cable King wire rope electric hoist. Dimensional diagrams and data included. The Yale & Towne Manufacturing Co.

RECTIFIERS

31. Leaflet 2343 entitled "Low cost direct current with permavac mercury arc power rectifiers". Illustrations and descriptive data. Allis-Chalmers Mfg. Co.

TOOLS

32. Catalog No. 31E consists of 40 pages of illustrations, descriptions and prices on tools for the electrician, carpenter and plumber. Greenlee Tool Co.

HAND TACHOMETERS

33. Bulletin 1585 describes the Frahm vibrating-Reed hand tachometers for measuring speed. Also describes other types of speed-measuring instruments. James G. Biddle Co.

SOCKET AND PLUG ASSEMBLIES

34. Jobber Bulletin No. 55J listing the Amphenol line of socket and plug assemblies. Illustrations and price list are included. American Phenolic Corp.

WELDER

35. Bulletin 412-A the "Shield-Arc" welder with self-indicating dual continuous control. Other models also described, and many illustrations. Lincoln Electric Company.

LAMP FIXTURES

36. Bulletin G featuring lighting fixtures for fluorescent lumiline lamps. Photographs and price lists included. Day-Brite Lighting, Inc.

NOCRETE

37. Booklet No. ECCDM for contractors on Orangeburg NOCRETE for installation underground without concrete encasement. Fibre Conduit Co.

LUGS & CONNECTORS

38. A folder describing and illustrating soldering and solderless lugs, test-lite and fuse puller, fuse clips, plug fuses, connectors. Dante Electric Mfg. Co.

MOTORS

39. Bulletin 1225 featuring explosion proof motors, listed as Type QZK. Illustrations included. Fairbanks, Morse & Co.

AUTOMATIC TAKE-UP REELS

40. A 52 page bulletin on automatic take-up reels for electric cable and air hose. Contains information which enables user to determine proper type of reel according to requirements. Appleton Electric Co.

LIGHTING STRIP

41. Sheets describing and illustrating fluorescent lighting strip with adjustable reflector. Specifications are included. Pickwick Metalcraft Co.

TIME SWITCH

42. Folder describing Model W synchronous electric time switch supported by time switch selector chart. Reliance Automatic Lighting Co.

POWER FUSES

43. Booklet F.8450 illustrates and describes dry boric-acid power fuses use for protection of high voltage circuits and equipment, applicable in utility and industrial power plants. Westinghouse Electric & Manufacturing Co.

CIRCLE NUMBERS—SIGN—AND MAIL

ELECTRICAL CONTRACTING **January**

330 West 42d St.
New York, N. Y. **(Not good after March 1)**

Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42	43	

NAME..... TITLE.....

COMPANY .....

ADDRESS .....

CITY..... STATE.....

New Heat Levels For Windings

[FROM PAGE 16]

single thread which is then connected to a swiftly revolving drum. Each drum contains approximately 12 miles of continuous glass fibers. These fibers have a very high tensile strength comparable to steel of the same diameter.

Spun glass magnet wire is manufactured in a manner very similar to that used in making silk or cotton-covered magnet wire. The glass thread is wound on bobbins, the number of threads varying with the size of wire to be covered. These small glass threads have a very high tensile strength, which aids greatly in the application of the fibers to the magnet wire.

High-temperature varnish is used as a binder in the application of the glass fibers. This material fills all interstices and thereby produces a magnet wire uniform in diameter, smooth, and easy to handle.

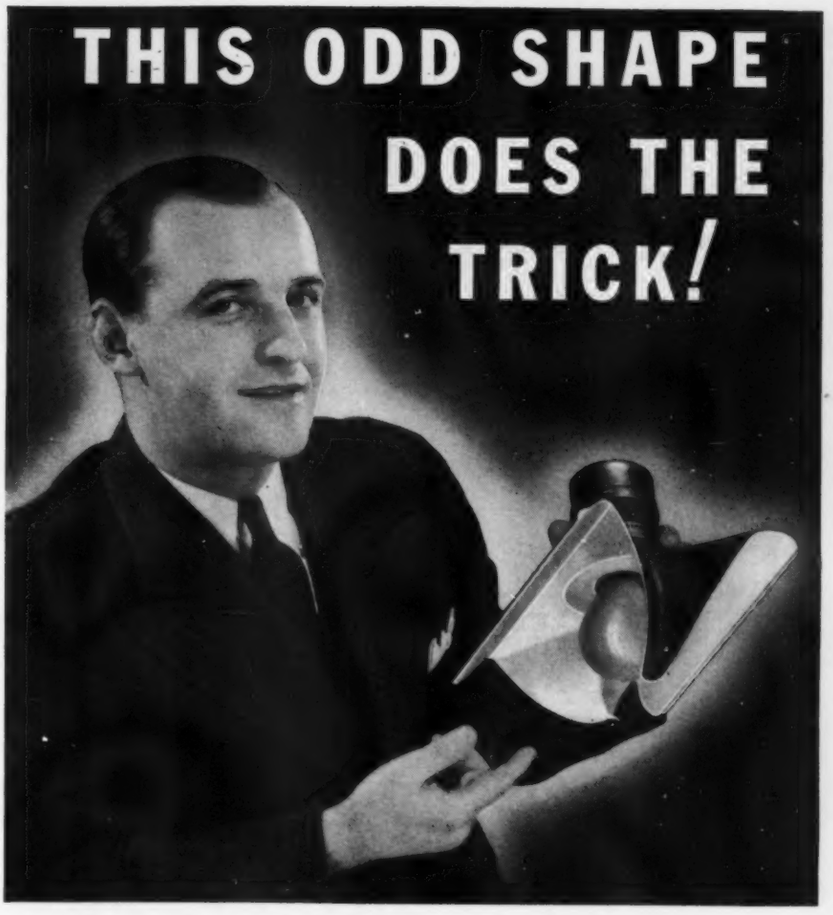
A Wide Selection

This new magnet wire can be supplied in all sizes, the same as included in silk, cotton and paper. It has a very high space factor and is desirable where smaller build ups are essential. The present space factor of the material is comparable to that of double silk. In addition to round, square and rectangular-glass-insulated magnet wire, lead or terminal wire is also available in commercial sizes. The construction consists of two servings of glass yarn covered by a glass braid. The wire is very flexible.

Glass insulation such as tape and varnished cloth has also been developed and can now be successfully used with this new glass-covered wire. Tape in all widths and thicknesses as low as .005 in. has been produced and is now available in varnished or natural form. For slot insulation, a glass and mica sheet material has been developed. This new insulation consists of sheet mica backed on both sides with glass cloth.

For wedges there is a heavy impregnated glass cloth. The resultant sheet is like Bakelite in appearance. It possesses the proper rigidity for wedge material.

And so engineers, designers and motor service organizations now have a flexible glass insulation to work with. It opens new possibilities in meeting high temperature insulation problems. high temperature insulation problems affecting electrical apparatus.



THE STOCKLITE

FOR LIGHTING SHELVES AND STOCK BINS

● How's the light in your stockroom aisles? If you're using ordinary lighting, try this fixture and see the difference! The Stocklite properly illuminates shelves from top to bottom and also bin interiors. Note how its peculiar shape directs light to the side . . . how the curved V-shaped flanges eliminate aisle glare. The Stocklite puts an end to "spotty" illumination—provides comfortable vision everywhere in the aisle—enables stock clerks to fill orders faster and more accurately. Users everywhere are enthusiastic. It's a porcelain-enameled fixture—an exclusive Goodrich product.

SEND FOR THIS NEW BULLETIN

It tells the whole story of proper stock bin illumination. It's complete with installation photos, specifications, light distribution curves, mounting data, etc., to help you sell. Ask for Bulletin No. 91, "Light on the Subject."

MEMBER OF R. L. M. STANDARDS INSTITUTE

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 2902 N. OAKLEY AVENUE, CHICAGO, ILL.

EQUIPMENT News

Transformers

Three new groups of transformers for fluorescent luminous tubing. Models with 12-MA and 18-MA secondaries are available for use with new fluorescent tubing in pastel shades; and 45-MA transformer for high intensity green and white tubing. Features such as the patented mid-point grounded design, non-aging low-loss cores, shock-proof primary and secondary terminals are included. Jefferson Electric Company, Bellwood, Ill.

JEFFERSON TRANSFORMER

■

Panel Instruments

A complete line of panel instruments covering industrial and radio applications in a variety of forms. Provides direct current, rectox types, thermocouple and alternating current. Two types of mechanisms are employed, the permanent magnet moving coil principle and the repulsion iron vane principle. Rated at 750 volts, at capacities as low as 20 microamperes in moving coil types. Distinguishing features are longer scales, flush and projection rectangular forms, flush rectangular case forms available in vertical or horizontal arrangement of front plate. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

WESTINGHOUSE PANEL INSTRUMENTS

NOGGLE PRODUCTS ADD-A-BIN

Bin Unit

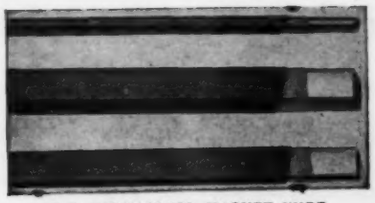
A system of unit bins sold separately and assembled by user to fit his individual needs for keeping track of screw, bolts, nuts, studs, washers, clips, contact points, tinsel, springs, brushes, fuses and many small parts required in the production and servicing of electrical equipment. Bin housing may be screwed to a wall or to a panel. Closes automatically when mechanic's hand is removed, or will lock open by lifting bin slightly. Noggle-Products Co., Ann Arbor, Mich.

■

TRICO FUSE PULLER

Fuse Puller

A new line of "De Luxe" fuse pullers for pulling and replacing fuses, adjusting switch and cutout clips, whenever live electrical parts are being handled. Style No. 123 has a screw and cap driver. Center pin or pivot is designed with screwdriver projection on head. When renewing ferrule type fuses, 0 to 60 amperes, both 250 or 600 volts, screwdriver is handy to loosen or tighten end screws or caps. Made in two sizes. No. 123 has five laminations 7½ in. long and No. 25 has seven laminations 12 in. long. Trico Fuse Mfg. Co., Milwaukee, Wis.



G.E. DELTAGLASS MAGNET WIRE

Magnet Wire

A new glass fiber insulation used for a new line of glass-insulated magnet wire is known as "Deltaglass." Available in round, square and rectangular shapes. Recommended for apparatus windings where temperature does not exceed 125 degrees Centigrade. Insulation is flexible, has high dielectric strength and because of special varnish resists abrasion. General Electric Company, Bridgeport, Conn.

■

Antenna Outlet

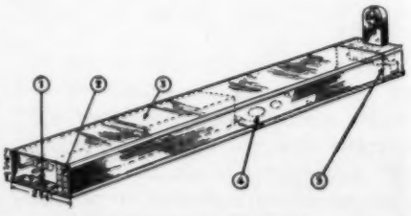
A compact radio outlet for noise reducing antenna of the V-doublet type for use with combination short wave and standard wave sets with two antenna connections. May be combined with duplex power outlet under a two-gang plate. Connections for power, antenna and ground are plainly marked on binding screws and boxes. Bryant & Co., Bridgeport, Conn.

BRYANT RADIO OUTLET

■

Fluorescent Strip

Combination of raceway, reflector and wired receptacle for the new fluorescent mazda lamps. Consists of channel, receptacle, covers and reflector ready to wire. Provides for convenient application and complete installation. Includes clamp to hold auxiliary coil, snap in receptacle for tube, knockouts for screws, cable or conduit. The Wiremold Company, Hartford, Conn.



WIREMOLD FLUORESCENT STRIP

TAKE ADVANTAGE OF THE *EXTRA* POINT . . .

The free-throw provides a chance to score, unopposed. Frequently, the final results are determined by the ability to take advantage of extra point opportunities.

You can easily add extra points to your "score" by the continued use of RACO • ALL-STEEL • PRODUCTS. The approval and preference which these products have won eliminate the unnecessary and costly task of overcoming opposition to materials used on your jobs.

RACO • ALL-STEEL • PRODUCTS have been developed by competent engineering to meet each of the many modern wiring job requirements in a clean workmanlike manner. They will help you meet the special needs of your locality in the most practical and economical way possible.

There is a total of over 40 years of experience behind the switch boxes, outlet boxes, cutout boxes, cabinets, fuse cabs and conduit fittings carrying these famous trademarks, which is your assurance of their continued quality and dependability.

Write for the catalog illustrating the complete line. There is no obligation.

Distributed Nationally by

ALL-STEEL-EQUIP COMPANY, INCORPORATED

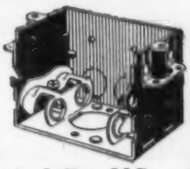
623 JOHN STREET • AURORA, ILLINOIS

Factories: South Bend, Indiana • Aurora, Illinois

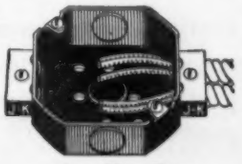
RACO • ALL-STEEL • PRODUCTS

SWITCH BOXES • OUTLET BOXES • CUTOUT BOXES
CABINETS • FUSE CABS • CONDUIT FITTINGS

A few of the products in the complete RACO • ALL-STEEL • PRODUCTS line:

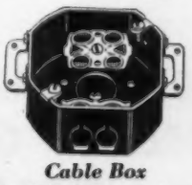


Switch Box MC—with XL clamps for armored cable



Jay-Kay Box
DO-25 N-JK—refined J-K clamps on outside provide more wiring room

Switch Box MF—for cable, with adjustable fixture bridge



Cable Box
DO-22N-OE—equipped with external mounting ears

SOLDER AND TAPE ARE OUT OF DATE!

IDEAL

MODERN METHODS

Bring Wiring Jobs

Make your wire joints without solder and tape — No open flame — No burned insulation— No burned ceilings or walls. No tools required —No twisting wires together —just strip wires and twist on an IDEAL "Thread-on" Wire Connector.

Just screw on, that's all—No twisting of wires!

IDEAL joints give lasting satisfaction because they're *better electrically, stronger mechanically.* No loose connections, no comeback service calls; a safeguard against shorts and burnouts.

IDEAL Connectors press clean threads into the wires, connector and wires being threaded together like a nut on a bolt.

FULLY APPROVED

Listed By
Underwriters' Laboratories, Inc.

SAMPLES UPON REQUEST

IDEAL COMMUTATOR DRESSER COMPANY

1041 Park Avenue
SYCAMORE—ILLINOIS

EQUIPMENT News

[FROM PAGE 70]

Lighting Fixture

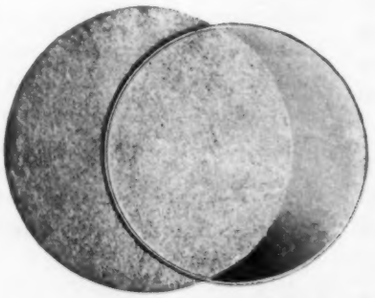
The Argyle lighting fixture is for interior use wherever indirect illumination is desired. One of its features is easy removal of bowl for relamping or servicing. Reflector may be lowered by releasing any one of its three supporting arms. Has ball swivel at canopy. Available in two sizes to accommodate lamps from 150 to 500 watts. Goodrich Electric Company, 2900 N. Oakley Ave., Chicago, Ill.

GOODRICH ARGYLE FIXTURE

■

Diffusing Filter

The "Mello-Beam Diffuser" for Fostoria Localites provides a combination of direct and diffused lighting from supplementary lighting units. The diffuser is made of glass fibers banded together to provide a soft pliable substance which accomplishes a combination of direct and diffused illumination. Standard thickness is .015 which has a transmission factor of 55 per cent. This diffuser is now optional equipment on most Fostoria Localite models. The Fostoria Pressed Steel Corp., Fostoria, Ohio.



FOSTORIA MELLO-BEAM DIFFUSER

■

Electric Marker

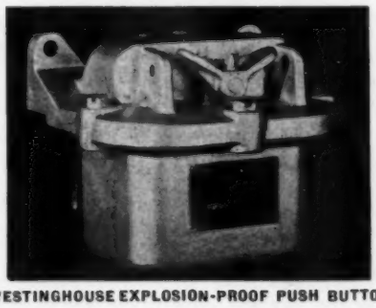
A new tool for permanently branding equipment, tools or parts with owners name, sizes, numbers, models or other information. Effectively marks steel, iron, bronze, glass, bakelite, ceramics, composition and other surfaces. Operates at a speed of 7,200 cutting strokes a minute, cutting into the surface of the material and leaving a clear, legible imprint. Equipped with a diamond point which permits marking materials up to 60 Rockwell hardness. Ideal Commutator Dresser Co., Sycamore, Ill.

IDEAL ELECTRIC MARKER

■

Explosion-Proof Push Button

A new line of heavy duty, type HD, push button stations for corrosive atmospheres and Class I, Group D hazardous locations. Available with from one to four standard push button units of momentary contact or maintained contact units. Stations available with two or three position selector switches, either as single pole, double throw switches or double pole, single throw switches. All bolts, shafts and fittings are of corrosion-resisting copper alloy. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



WESTINGHOUSE EXPLOSION-PROOF PUSH BUTTON

■

Safety Switches

A new line of front operated, safety switches, with and without Bakelite dead front. Built to perform at full 30 ampere capacity. Base has separate terminals for each wire. Push in for "off" position, pull out for "on" position. Accidentally brushing against switching handle will not throw switch in "on" position. Wadsworth Electric Mfg. Co., Inc., Covington, Ky.

WADSWORTH SAFETY SWITCH

Wireholder

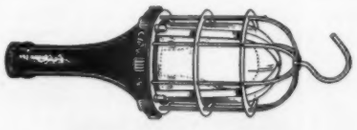
A new "schackle" metal supported wireholder, which places the porcelain part in compression. Outstanding features are heavy construction, strength and durability, coupled with ultra-modernistic design. Knox Porcelain Corporation, Knoxville, Tenn.

KNOX PORCELAIN WIREHOLDER

■

Vaporproof Lamp Guard

A lamp guard for use on portable or extension lights where inflammable gases, liquids or materials may present dangers of fire, spark, exposed flame, heat or breaking of light bulbs. Eight heavy wires and two interlacing bands form the hard brass cage. A hook with a two-inch opening is screwed into nut at top of cage to permit guard to hang. Inside cage is a globe of pyrex glass which covers light bulb. Available in two sizes, No. 3002 for lamps up to and including 60-watt size; the other No. 3005 up to and including 100-watt size. McGill Manufacturing Co., Valparaiso, Indiana.

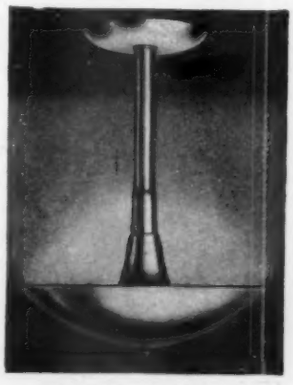


McGILL LAMP GUARD

■

Indirect Fixture

A high efficiency line of totally indirect fixtures. Aluminum hanger and reflecting bowl are finished in satin aluminum. A polished aluminum shield takes the place of the elongated husk, raising efficiency to 89.4 per cent. Available for 200 to 500-watt standard or silver bowl lamps and 750 to 1000-watt bi-post lamps in four sizes. White enamel reflecting surface. The F. W. Wakefield Brass Co., Vermillion, Ohio.



WAKEFIELD INDIRECT UNIT

QUAD

IS YOUR ANSWER

Long Beam Floodlight

This complete line of Reflectors and Floodlights affords you full opportunity to meet all requests from your prospects for new and replacement lighting needs—indoor and outdoor—industrial and commercial. Depend on Quad—see your Wholesaler.

Duplex Dome Reflector

QUADRANGLE MFG. COMPANY
32 SO. PEORIA ST. CHICAGO, ILL.

Badger

Synchronous
ELECTRIC TIME SWITCH

For Real Profit

$ $ $ $ $ $

Complete dependability in operation is the quality that makes these Badger time switches really profitable for you. Wire 'em and forget 'em—they will give years of satisfactory service.

The complete Reliance line includes the BADGER, RELIANCE, RACINE and the MODEL W RELIANCE—a time switch for nearly every application. Write for full information.

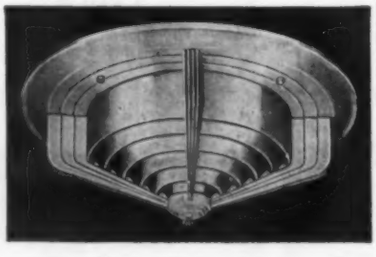
RELIANCE AUTOMATIC LIGHTING COMPANY
1937 MEAD STREET
RACINE, WISCONSIN

For A. C. loads up to 50 amperes. Furnished in single and double pole types and in either cast iron or sheet steel cases. $18.00 and up. Underwriters' Laboratories approved.

★

TURN MERCHANT PREFERENCE into CONTRACTS

All over the country, in large cities and small towns, thousands and thousands of merchants are realizing the vital importance of efficient lighting —are learning that **Sterling** Lite-Flo Reflectors can give them amazing improvement in show window lighting with the same operating cost — learning that STER-LITE Louver-Controlled Direct-Lighting Units offer the ideal light for store interiors.



And Contractors everywhere are finding **Sterling** Products offer the PLUS VALUE that wins commercial wiring contracts.

Catalog and **Sterling** Co-operative Sales Plan for Contractors mailed promptly on request.

STERLING REFLECTOR CO.
1435 W Hubbard St CHICAGO

EQUIPMENT NEWS

[FROM PAGE 73]

Fluorescent Localite

New Fostoria canopy "localite" for fluorescent mazda tubes. Five models, equipped with wiring, socket, ballast and switches for use with either 18 in. or 15 in. tubes. Canopy is 13¼ inches wide by 20 inches long by 5 inches deep. One model for overhead installation, two for bench or table use, one for portable floor and one for trolley track. Fostoria Pressed Steel Corporation, Fostoria, Ohio.

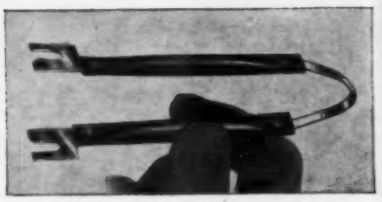
FOSTORIA FLUORESCENT LOCALITE

■

Spring Hammer

This spring hammer is designed as a floor to ceiling tool, for drilling upward holes and installing self-drilling expansion shells in concrete ceilings and for drilling from scaffolds. Device equipped with cranks for manual operation interchangeable with hand drilling unit. Phillips Drill Company, 1551 Cortland St., Chicago, Ill.

PHILLIPS SPRING HAMMER



SCHWEITZER & CONRAD FUSE LINK

Fuse Links

A fuse link for plug cutouts used on distribution systems. They provide for two gaps in series following the blowing of the fuse, with result that the dielectric strength of the cutout assembly is increased. Greater resistance to corrosion is gained by tinning the copper terminals. Short-circuit interrupting capacity of cutout is increased, and their use reduces tendency to set up an arc between cutout terminals by directing arc gases upward. Made in capacities of 3, 5, 10, 15 and 25 amperes. Schweitzer & Conrad, Inc., 4435 Ravenswood Ave., Chicago, Ill.

■

Small Motors

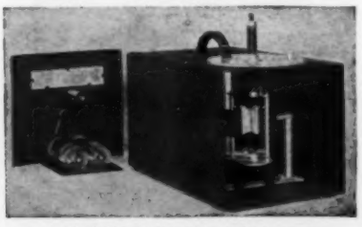
A new complete line of fractional horse power motors. Sizes from ½ to ¾ hp., repulsion start induction, single phase, split phase, capacitor, polyphase and direct current. Featuring interchangeable mounting dimensions for a given hp. size. Century Electric Co., St. Louis, Mo.

CENTURY FRACTIONAL H. P. MOTOR

■

Electrostatic Voltmeter

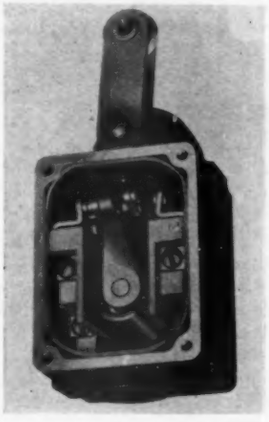
A portable electrostatic voltmeter for measurements of a.c. or d.c. voltages on ground systems. Features fast response, constant calibration, light-beam pointer, magnetic damping and a specially designed high voltage terminal with a current limiting resistor for increased safety. Available in ratings of 3, 5, 10, 15 and 20 kilovolts. General Electric Co., Schenectady, N. Y.



G-E ELECTROSTATIC VOLTMETER

Limit Switch

Snap-lock switches adaptable for machine limit switches, conveyor lines, safety switches, counting switches and other applications where a mechanical or manually operated switch is required. Features double break contacts in a separate enclosure from the operating mechanism. Switch operates within a 10 deg. travel of the operating arm with an additional overtravel of 29 deg. Case is compact, oil proof, dust proof and may be mounted at any angle. The National Acme Co., Cleveland, Ohio.

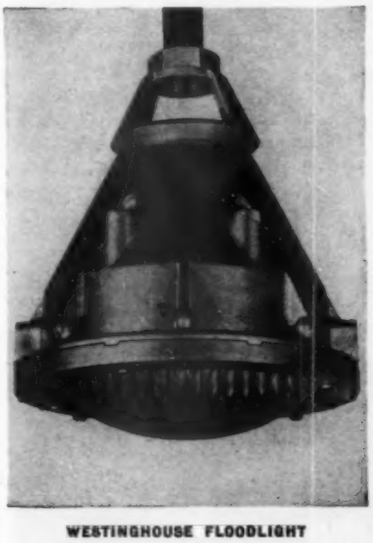


NATIONAL SNAP-LOCK SWITCH

■

Underwater Floodlights

Type CF-14 and CF-16 aqualux underwater floodlights are designed for use in fountains, pools, and water falls. A thermo pressure treatment is used to eliminate water seeping into unit. Does not require drainage or ventilation. Colored lenses are mounted externally on CF-14 and internally on CF-16. Mountings available are bow and 1½-in. pipe clamp base, swivel base, bow and triangular base and bow and flanges for 1¼-in. vertical pipe mounting. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.



WESTINGHOUSE FLOODLIGHT

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Tough — long wearing — heavy duty

60% jacketed

PORTABLE CORDS

WELDING CABLES

MINING MACHINE CABLES

Designed for maximum flexibility, to resist fracture due to twisting, and with strength to withstand sharp jerks and pulls under torsion.

Send for samples.

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ROME, N.Y.

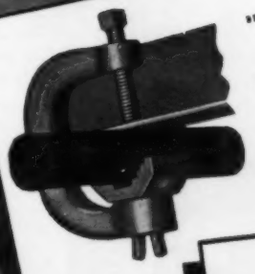
PRODUCTS

Hot rolled rods, bare and tinned copper wire, bare and tinned strand, U.R.C. weatherproof wire, cotton, paper and asbestos magnet wire, rubber insulated wires and cords, lead covered cables.

SALES OFFICES

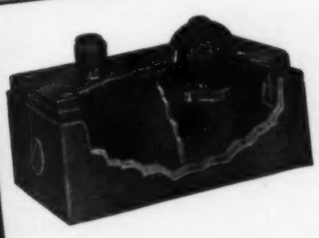
New York, Chicago, Philadelphia, Pittsburgh, Richmond, Cleveland, Boston, Los Angeles.

FLOOR BOXES AND WIRING SPECIALTIES



"Bull Dog" Pipe or Conduit Hanger

Pipe support can be turned freely, permitting pipe to run parallel, or at right angles to beam. Eliminates drilling or use of straps. Will accommodate sizes of ½", ¾" and 1" pipe to steel beams ⅜" thick.



No. 252-R Two Gang Box

Two gang Adjustable Floor Box with No. 208 Receptacle in one section. One cover plate with ½" Flush Brass Plug and the other cover plate with 2" Flush Brass Plug.

The *Latrobe Line* is complete for all residential, commercial, and industrial requirements. In addition, the entire line is designed with the idea of retime . . . an important point to consider when selecting floor boxes and wiring specialties.

No. 130 "Latrobe" Adjustable Water Tight Floor Box

No. 130 Box with No. 207 Bell Nozzle. Cut-away view illustrates how tapered unit receptacle fits tapered opening in adjustable ring. Design alliminates many small parts. Cover plate 3½" —overall height 3½".

FULLMAN MFG. CO.

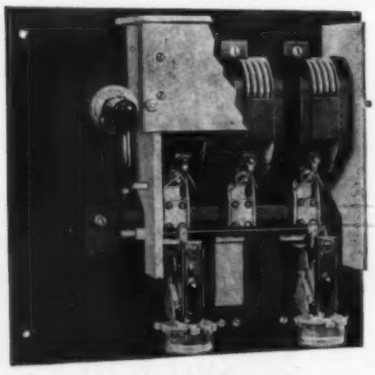
LATROBE • PENNA.

EQUIPMENT News

[FROM PAGE 75]

Air Circuit Breaker

A new air circuit breaker for protecting power and lighting circuits in central station, industrial and building-equipment service. Type AE-1A, is available in ratings 600 volts a.c., 250 volts d.c., 15—225 amperes. Breaker is enclosed in a steel housing, with a system of arc quenchers and barriers which prevent arcs between contacts and the steel cover. Available in single, double, triple and four pole units. Manual or electrical operation, for live- and dead-front switchboard mounting, or metal enclosures with or without pull-boxes for individual mounting. It has dual magnetic over-current devices, although dual magnetic-thermal devices can be substituted. General Electric Company, Schenectady, New York.



G.E. AIR CIRCUIT BREAKER

■

Tap

A new, universal type, combination tee-parallel tap, known as "Hinjon Junior". The fitting, in three body sizes, takes any type of wire, cable or tubing from 1/0 to 500 MCM on the main and No. 14 to No. 4 on the branch. Tap is of one piece construction, and slightly larger than cable, over insulation. It is cast of high conductivity copper alloy. The Thomas & Betts Co., 36 Butler Street, Elizabeth, N. J.

THOMAS & BETTS TAP

Voltage Regulator

A new panel type voltage regulator known as Voltrol. Permits adjustment of alternating current voltage from 0 to 135 volts. Unit consists of specially designed heavy duty auto transformer. Has non-burning, non-fusing, self-lubricating rheostat contacts that tap each individual turn of the winding and makes possible a more accurate control of output voltage. Acme Electric & Mfg. Co., Cuba, New York.

ACME ELECTRIC VOLTROL

■

Starting Capacitor

Dry electrolytic capacitors for motor starting and other a.c. applications. Hermetically sealed in small aluminum cans and externally insulated with an impregnated fiber sleeve. Designed for operations involving a maximum of 20 starts per hour each of three seconds duration. Specially suitable for fractional hp. motors used in home appliances. Cornell-Dubilier Electric Corp., South Plainfield, New Jersey.

CORNELL-DUBILIER CAPACITORS

■

Explosion-Proof Motor

A new line of explosion-proof, ball-bearing motors, approved by Underwriters' Laboratories for Class I. Group D, hazardous locations. Insures against accidental ignition or explosion of vapors or gases prevalent in plants producing or employing gasoline, acetone, alcohols, volatile oils or combustible gases. Built in NEMA frames can be applied to pumps, blowers, production machines as easily as any standard

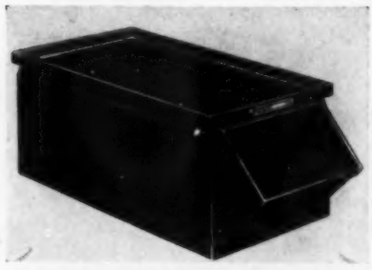
FAIRBANKS MORSE MOTOR

open motor. Has double-end ventilation, eliminating "hot spots". Fairbanks, Morse & Co., 600 S Michigan Ave., Chicago, Ill.

■

Stacking Boxes

An improved construction to increase effective life of steel stacking boxes and stack units for handling and storing all types of small parts. A wide, deep, formed stacking rim around the top of each unit allows boxes to be stacked without danger of tipping or telescoping. Reinforced with 12 gauge drawn steel angle formed pieces locked and welded in position under the hem at the top corners of the boxes. Improved boxes will stack interchangeably with earlier types. All-Steel-Equip Co., Inc., Aurora, Ill.

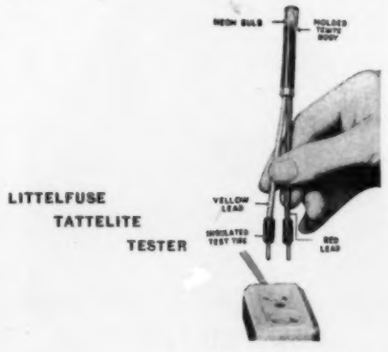


A-S-E STACKED BOX

■

Testers

A pocket size tester, known as Tattlelite, is for use of electricians, line men, radio and refrigeration service men and electrical maintenance workers. They test for live or open circuits, blown fuses, defective condensers and resistors, tell whether current is a.c. or d.c., indicate grounded line, and approximate voltage. Uses small neon bulb, glowing on only 1/10,000 ampere current. Littelfuse Laboratories, Inc., 4238 Lincoln Ave., Chicago, Ill.



Soldering Iron Stand

A new soldering iron stand with automatic heat control. Single unit consists of base, containing automatic thermostatic switch which consumes no current, and a bracket attached on top of base to hold iron. When iron is laid on stand, its heat is held at constant temperature until removed, at which time full current is automatically turned on. It is portable and installed by plugging extension cord into any outlet and plugging soldering iron cord into receptacle on unit. Handles all irons up to 2000 watts in 110 or 220 volt a.c. and up to 500 watts d.c. C. E. Hayes, 3701 North Broad St., Philadelphia, Pa.

HAYES SOLDERING IRON STAND

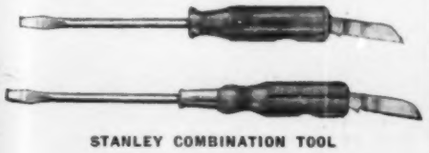
Rotary Motor Switch

A triple pole rotary surface switch with black bakelite cover. Carries a 2 hp. rating on three phase 230 to 575 volts. The Bryant Electric Co., Bridgeport, Conn.

BRYANT ROTARY SWITCH

Jack Knife Screw Driver

A new combination tool designed for use by electricians, auto mechanics and householders, looks like a standard tip, six-inch blade screw driver, but in the handle there is a jack knife that opens out when wanted. Available in two styles. No. 1022 jack knife is permanently locked in natural color hardwood handle. No. 1023 can be released from the metal sheath in handle by pressing button and used as a separate tool. Stanley Tools, New Britain, Conn.



STANLEY COMBINATION TOOL

TRADE PAINE MARK

THE PAINE OUTLET BOX AND FIXTURE HANGER . . .

will do your job quicker and better

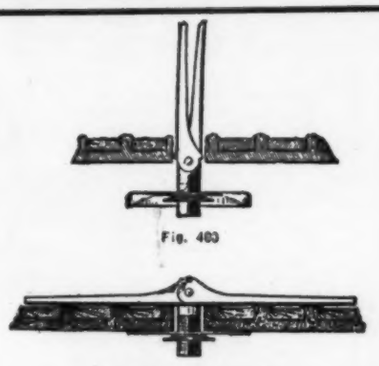


Fig. 403

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List $122.00

Powered by heavy duty *ball bearing* ¼ H.P. motor, this new exhaust fan will exhaust against a strong wind pressure. For single phase A. C. motor is capacitor type, rubber mounted. Can be furnished single and three phase, and direct current. Rugged frame is steel construction with all joints securely welded. Finish is durable black wrinkle.

AUTOMATIC SHUTTERS

To the fan opening these Signal Automatic Shutters provide weather-tight protection . . . Signal Shutters cannot be opened from the outside by the wind. Write for complete details.

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TONG TEST *Ammeters*

Do you want to get **MORE** Rewiring, Motor Service and Repair **JOBS** in 1939

Show owners exact condition of wiring with the NEW "DM" "3 in 1" MEGOHMER *with* TRIPLE COLOR GRADING SCALE.

As easy to use as a tube tester, and as easily understood by your prospects. It classifies wiring as good, fair or doubtful. A scientifically accurate selling tool, to help you make more money. Send for description TODAY.

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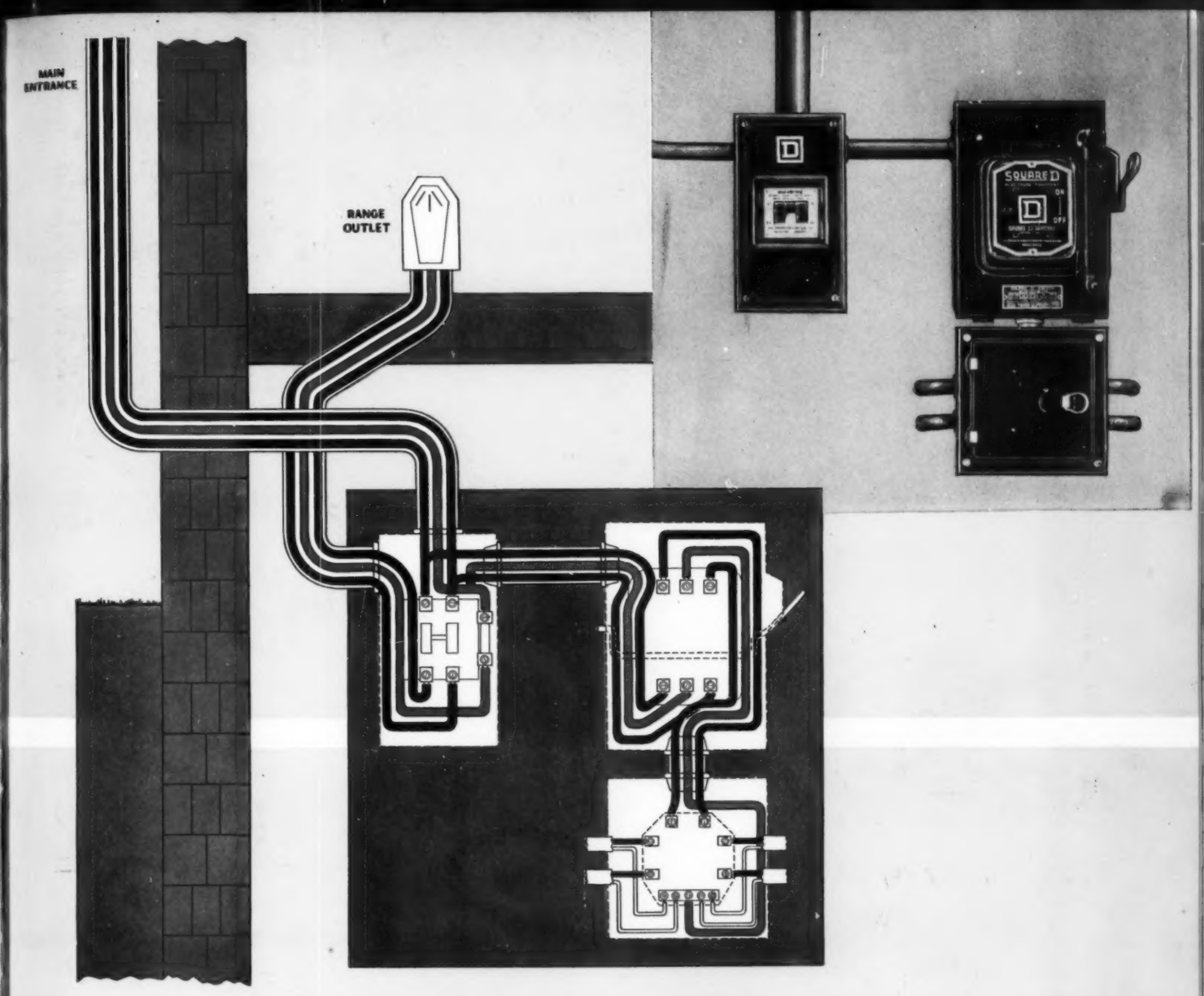
YOUR GREATEST BUYING AID for 1939

See Pages 64-65



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A RANGE OR WATER HEATER CIRCUIT
WITH A SQUARE D MULTI-BREAKER

• When the service entrance switch of a home does not have sufficient capacity for the addition of electric range or water heater, it is easy and economical to add extra circuits by using a Square D Multi-breakeR. The Multi-breakeR is service equipment and may be installed in parallel with existing wiring.

The installation costs less than replacing the service entrance switch with one of larger capacity. The two-pole Square D Multi-breakeR provides circuit breaker protection at an extremely low price.

The 1937 National Electric Code permits up to six service subdivisions or branches, individually controlled with solid mains, when Multi-breakeRs are used.

You'll profit by following up the electric range and water heater campaigns of the Power and Light Companies. Get your share of this business with the Square D Multi-breakeR.

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INSTALL G-E HOME WIRING* FOR LARGER WIRING JOBS FOR SATISFIED CUSTOMERS

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